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# INFANT MORTALITY IN NEW YORK CITY

BY

ERNST CHRISTOPHER MEYER, Ph.D.

DIRECTOR OF SURVEYS AND EXHIBITS

THE ROCKEFELLER FOUNDATION  
INTERNATIONAL HEALTH BOARD  
NEW YORK CITY

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NEW YORK CITY





# INFANT MORTALITY IN NEW YORK CITY

A STUDY OF THE RESULTS ACCOMPLISHED  
BY INFANT-LIFE SAVING AGENCIES

1885-1920

BY

ERNST CHRISTOPHER MEYER, P.H.D.

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PUBLICATION NO. 10

THE ROCKEFELLER FOUNDATION  
INTERNATIONAL HEALTH BOARD  
NEW YORK CITY

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## INTRODUCTORY NOTE

The details upon which this report is based were collected in 1915 and 1916 for the immediate purposes of the International Health Board. Typewritten copies of the study were, however, made available to interested persons on request. Since then there has been a growing demand that the report be published. It was finally decided to do this after the Department of Health of New York City had given its ready consent.

All important tables and graphs have been brought up to date. The text, however, as will be noted, deals with the material which was in hand when the study was closed in 1916. There have been no developments since that time in the field of infant care in New York City of such importance as to call for modification of the general conclusions arrived at in 1916.

We are indebted for valuable help, in particular, to Dr. S. Josephine Baker, whose singular devotion to duty and enthusiastic and able administration of the work of the Bureau of Child Hygiene have contributed to bringing about

conditions under which infant life is more secure in New York City than in any other great city of the world.

Acknowledgment is made also of the efficient assistance rendered by Miss Jean E. Chandler in the collection of data used in this report.

ERNST CHRISTOPHER MEYER.



## EXPLANATORY NOTE

1. A list of sources appears on pages 104-111. Each source bears a number. When, in the text, reference is made to a source as (*Guilfoy 30-10-1917*), it means that authority for the statement is found on page 10 of source number 30, published in 1917, of which Guilfoy is the author.

2. Unless otherwise specified, an *infant* is understood to be a baby under one year of age, and the *infant-mortality rate* is assumed to be based on the number of living births as reported to the health department of the city.



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# I

## A GENERAL SURVEY OF THE DEVELOPMENT OF INFANT-LIFE PRESERVING FORCES FROM 1885 TO 1915

**Purpose.** So far as statistical and other available data might make the attempt seem worth while, it was proposed:

1. To seek to identify in a large way those infant-life preserving forces which came into being during the thirty-one years from 1885 to 1915, and which contributed most to the remarkable reduction in infant mortality which took place during that period.

2. To examine in detail the efforts made and the results obtained by those public and private agencies interested in reducing infant mortality whose scope of work and completeness of record commended them for such a study.

In undertaking the work it was not expected that all forces could be identified which contributed to bringing the infant-mortality rate of New York City down to where, in 1914 and 1918, it was second to none among the great

cities of the world. It may be, however, that the material brought together will help in gauging the relative importance of the leading forces which played a part in this reduction. It may also tend to upset some impressions and some convictions which have previously been held concerning them.

The investigation is confined to work done in New York City.

**Method.** While the avowed purpose of infant-welfare work is to keep well babies well rather than to save the lives of sick babies, the end results consist partly in the reduction of infant mortality and partly in benefits of importance to the increasingly large number of infants who survive. Since these latter benefits cannot be definitely determined or expressed, it has become customary to express the results of infant-welfare work in terms of reduction of infant mortality. This method is used in the present report.

With a view to providing a large picture of the degree of security of infant life in New York City, a general study was made covering the thirty-one-year period from 1885 to 1915. The extent of infant-life saving and the relative importance of the forces contributing to this result,



in so far as their identity could be established, were investigated and described.

To throw light on the methods and results of intensive infant-welfare work, a detailed study was made of this work during the period from 1910 to 1915, with emphasis on the year 1915. Applying the generally accepted view that reduction in mortality is the best measure of benefits of other kinds derived from this work, it seemed appropriate to seek to determine:

1. The saving in lives up to the close of the first year of the infant's life: (*a*) during the period of care; (*b*) after the period of care.
2. The saving in lives in later years as the result of care in or during the first two years.

Some important material was developed concerning the saving in lives during the period of care. Nothing could, however, be accomplished to show statistically the saving in lives after the period of care, for the infant after termination of its enrolment at a baby health station<sup>1</sup> or with a home-visiting nurse completely

<sup>1</sup>To give greater expression to their broader functions, the centers at which infant-welfare work is carried on by both municipal and private agencies were called *baby health stations* instead of *milk stations*, beginning July, 1916. In this report, both terms are employed, *milk station* being generally used in discussing the early years of infant-welfare effort.

loses its identity and is merged with the general infant population of the city. Whatever benefits it may have derived from previous good care will thus contribute to a decrease in mortality and morbidity on the part of the infant population as a whole.

Nothing short of carefully following up the records of large numbers of infants that had benefited by intensive care, with a view to establishing mortality and morbidity rates, could provide the necessary statistical basis for useful comparisons. It is not known that such follow-up work has been successfully carried out.<sup>1</sup> Its difficulties, because of the mobility of the population and other factors, are such as to challenge the expediency of such an attempt. The decline of the mortality rate of the city as a whole was, therefore, the only available source of information as to the future benefits of early care. This source was used. The benefits derived from general educational work among mothers likewise can be studied only from this large point of view, owing to incompleteness of statistical records.

Results other than those expressed in lives saved, which necessarily escape measurement in

<sup>1</sup> An attempt to do this was made in Health District No. 1.

any statistical study of reduction in mortality, can only be described or suggested. This is true of the reduction in morbidity and of the general improvement in vitality which comes from improvement in the living conditions of infants. It would seem, however, that the extent of these benefits is in a general way expressed by the extent of life saving. From this it follows that the cost of life saving becomes an index—though obviously not a complete one—of the value of this kind of work. It also becomes the most accurate measure of the relative efficiency and value of different methods for the reduction of infant mortality, or of the same methods under varying conditions of work.

The principles just outlined served as a general background in determining both the method of the present investigation and the manner of statement of its results.

**Limitations in records.** The thirty-one-year period from 1885 to 1915 was selected because statistical and other data were so incomplete as to make an investigation prior to 1885 of doubtful value.

The city at no time has published precise mortality rates for infants enrolled at its milk stations or cared for by its visiting nurses. It has,

however, for some years published from week to week statistics of the number of babies reached by its milk stations and total deaths among these infants. Unfortunately, owing to faulty statistical methods and inadequate descriptive phraseology, both classes of figures are misleading and of little value for the purpose of determining the effectiveness of this form of work.<sup>1</sup> The same comment seems to apply to the statistics published by the city concerning the operation of baby health stations by private agencies.

The enrolment records and personal infant histories kept by the city in connection with the operation of milk stations and of home-visiting nurses were, however, found to be very complete. Unfortunately, basic data from these records were not adequately worked up. The task of doing this for a series of years was set aside as impractical, so that the investigation was confined almost wholly to one year, 1915. The experience of even this one year could be studied with only partial success, both as to the cost<sup>2</sup> of

<sup>1</sup> See in this connection page 43. Dr. S. Josephine Baker, who, since the organization of the Bureau of Child Hygiene in 1908, has been its able head, is much interested in the standardization of infant-welfare work so that both methods and results may in the future be clearly and correctly shown.

<sup>2</sup> More recently figures were secured for 1915 which were not available at the time the study was completed.

work and as to the amount and value of work done. It is obvious, therefore, that this report should be considered as suggestive rather than conclusive.

So far as private agencies were concerned, it was found that the records of work done in operating milk stations largely resembled those of the city. In most cases, however, records for the cost of work were not such as to permit of the derivation of unit costs which might be successfully used for comparative purposes.

**Organization of Child-Welfare Work of the City.** New York City was doing in 1915 the most extensive work in the field of infant welfare that was being done anywhere in the country.<sup>1</sup> It was, however, of recent origin, dating largely from 1912. Prior to that the work carried on by private agencies overshadowed that done by the city. Barring the important indirect activities engaged in by several municipal bureaus in connection with the supervision of the milk supply, the work done by the city was carried out largely through the Bureau of Child Hygiene. This bureau is one of the nine coordinate bureaus of the Department of Health. It is presided over by a director who, in 1915,

<sup>1</sup> This holds true in 1921.

was paid at the rate of \$5,000 per year. It had for that year an annual pay roll of about \$650,000, of which over \$260,000 was used specifically for the reduction of mortality and morbidity among infants.

The administrative work of the Bureau of Child Hygiene at that time was in the hands of seven division chiefs and included the following departments of work:

- 1—Division of Midwives and Foundlings.
- 2— “ “ Baby Welfare.
- 3— “ “ Institutions and Day Nurseries.
- 4— “ “ School Medical Inspection.
- 5— “ “ Children’s Clinics.
- 6— “ “ Employment Certificates.
- 7— “ “ Research and Efficiency.

In each of the five boroughs (Manhattan, Bronx, Brooklyn, Queens, and Richmond) a borough chief has direct oversight of the bureau activities. Within the bureau, infant-welfare work rests largely with a Division of Baby Welfare, which supervises the work done by the city milk stations. Since 1916, as already stated, these stations have been known as *baby health stations*.

On a less extensive scale, work is carried on during the summer months under the supervision of the Division of School Medical Inspection. During the summer of 1915 some 108 nurses,

who were released from school work, devoted their time to the home-visiting of well infants. In addition to this, the Division of Midwives and Foundlings and the Division of Institutions and Day Nurseries do work along lines suggested by their names. A special appropriation of \$20,625 (*New York City 44-313-1915*) served in 1915 for the employment of more than fifty additional nurses, eight of whom were active all the year round on prenatal work. The rest devoted their time in part to specialized work in the Division of Midwives and Foundlings, and in part to work in the Division of Baby Welfare.

**Organization of Child-Welfare Work of Private Agencies.** Private agencies in New York City are doing work on a scale unrivaled anywhere else in the country. There are between 350 and 400 organizations in the field (*Babies' Welfare Association 36-2-1916*).<sup>1</sup> With some, child-welfare work is merely incidental to general public welfare work; others specialize in this field.

<sup>1</sup> Interesting details as to the scope and character of work done by those organizations may be found in a directory of *Infant Welfare Agencies of Greater New York*, compiled by the Babies' Welfare Association and published by the Bureau of Child Hygiene in 1914.

Each of the numerous private agencies has its own income and manages its own affairs. It has been found expedient, however, to place in a central organization certain powers of co-ordination and co-operation. This central organization is known as the Babies' Welfare Association. It was organized in 1912. It is composed of representatives of about one hundred agencies, all of which do work affecting infant life under two years of age. Some of these organizations annually contribute toward the salary of an executive secretary. The city health department furnishes office space in its own building and supplies stenographic service, postage, telephone, and printing. It also gives the services of a full-time nurse (*American Association for the Study and Prevention of Infant Mortality 2-408-1915*).

The Association aims "to save babies by saving wasted effort." It acts as a clearing-house for information. It prepares educational literature. It issues a weekly bulletin. It renders particularly important service in placing with the most suitable hospital, nursery, home, or other agency, infants that various organizations wish to put in other hands and under other influences than those of the home.



**Security of Infant Life in New York City.** During the thirty-one years from 1885 to 1915, the death rate among infants under one year of age living in New York City dropped from 273.6<sup>1</sup> to 94.6 per 1,000 living births in 1914. This gave New York not only the lowest rate among the ten largest cities in the United States, but also the lowest rate among the great cities of the world. From 1915 to 1919, however (with the exception of the year 1918), St. Louis reported rates that were lower than those for New York.

The comparative rates for the ten largest cities of the United States from 1914 to 1919 were:

City	Infant-Mortality Rate					
	1914	1915	1916	1917	1918	1919
New York, N. Y.	94.6	98.1	93.1	88.8	91.7	81.6
St. Louis, Mo....	103.3	82.1	89.4	79.7	94.5	75.2
Boston, Mass....	103.7	103.0	104.9	98.9	114.9	96.8
Pittsburgh, Pa...	115.2	107.7	113.8	116.2	122.5	115.3
Cleveland, Ohio..	116.4	110.6	107.0	104.9	95.4	90.8
Philadelphia, Pa..	117.6	106.2	101.0	110.0	126.0	89.8
Buffalo, N. Y....	121.5	108.2	113.9	103.7	121.5	109.8
Detroit, Mich....	122.4	104.3	112.8	103.6	100.7	96.8
Chicago, Ill. <sup>2</sup> ....	132.7	102.5	111.9	106.4	104.3	91.0
Baltimore, Md...	154.6	119.8	118.2	119.3	147.8	97.0

<sup>1</sup> Based on the estimated population under one year.

<sup>2</sup> Figures given for Chicago are based on estimated births.

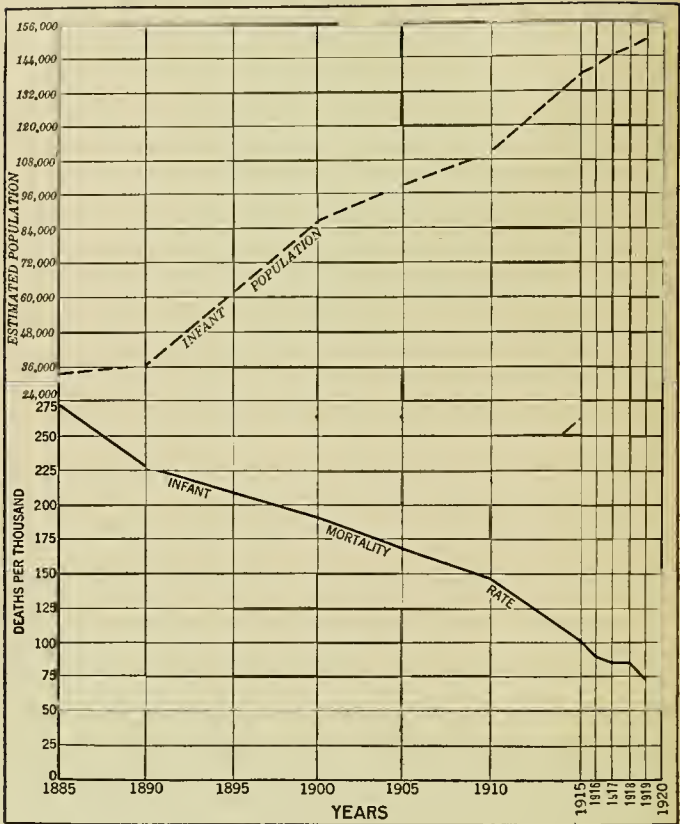


Fig. 1. Estimated population under one year of age and infant-mortality rate based on estimated population in New York City during the period 1885-1919

The diagram presented above, Figure 1, shows how the death rate among infants in New York City has been steadily growing lower, while the number of infants born in the city has

been rapidly growing larger. No other large city in the country seems to be able to show an equally rapid and constant decline in its infant-mortality rate.

While the reduction in the death rate among infants under two years of age was great, the reduction among children from two to five years of age was likewise remarkable, as is evidenced by the table which follows:

DEATH RATES PER 1,000 CHILDREN LIVING (ESTIMATED)  
IN NEW YORK CITY <sup>1</sup>

Five-Year Period	Average Death Rate per Thousand		
	Under 1 Year	Between 1 and 2 Years	Between 2 and 5 Years
1904-1908 incl. ....	159.0	48.4	15.0
1909-1913 incl. ....	120.0	36.3	10.9
1914-1918 incl. ....	93.2	28.4	9.7
Decrease per cent, 1904-13....	24.5	25.0	27.0
“ “ “ 1909-18....	22.3	21.7	11.0

The figures just presented confirm the view that better care of infants will find expression in greater ability to survive on the part of growing children.

<sup>1</sup> *Baker 31-66-1915; New York City Bureau of Child Hygiene 29-1-1920.*

**What Increased Security in Infant Life Means.** If the 137,798 infants (*Guilfoy 72b-I-1916*) under one year of age who lived in the city in 1915 had lived there in 1885, there would have been no less than 37,696 deaths. As it was, there were only 13,866 deaths. This is a saving of 23,830 lives in 1915 owing to an increased security in infant life since 1885.

The change which brought this about is revolutionary. The infant-life preserving forces which accomplished this saving were clearly forces of great magnitude and of wide influence. Their identification and the determination of the share which each had in saving infant lives would be of much value in pointing the way in infant-welfare work. Unfortunately, the statistical data which are needed as a basis for such determination are, in most cases, almost wholly lacking. In order that the degree of accuracy of facts used in this report might always be evident, every effort has been made on succeeding pages to show clearly where the facts came from and how they were used.

**Influence of the Method of Calculating the Infant-Mortality Rate on the Statistics Showing Its Decline.** It has been stated that the rapid decline in the infant-mortality rate

of the city could be explained in part, if not indeed in large part, by the fact that the rate, as commonly used, was based on reported births. About 98 per cent of all births are at present reported in the city. Probably less than 80 per cent were reported thirty years ago.<sup>1</sup> As the number of births reported increased, the death rates, based on reported births, necessarily decreased. In similar fashion the death rate, when based upon the estimated population under one year or on the estimated number of births which took place, was bound to be different from that based on reported births. Critics of the rates developed by these various methods seem generally to have much exaggerated these differences. This is shown on page 16, Figure 2. One line (A) shows the decline of the infant mortality rate when based on the estimated population under one year; another line (B) shows the decline when based on reported births; and the third line (C) shows the decline when based on the estimated births. The chart is based on statistics presented elsewhere.<sup>2</sup> It contains minor inconsistencies. It was not possible to untangle satisfactorily the labyrinth of figures of widely

<sup>1</sup> Information supplied by the Bureau of Records of the Department of Health of New York City.

<sup>2</sup> See Appendix IV, insert following page 130.

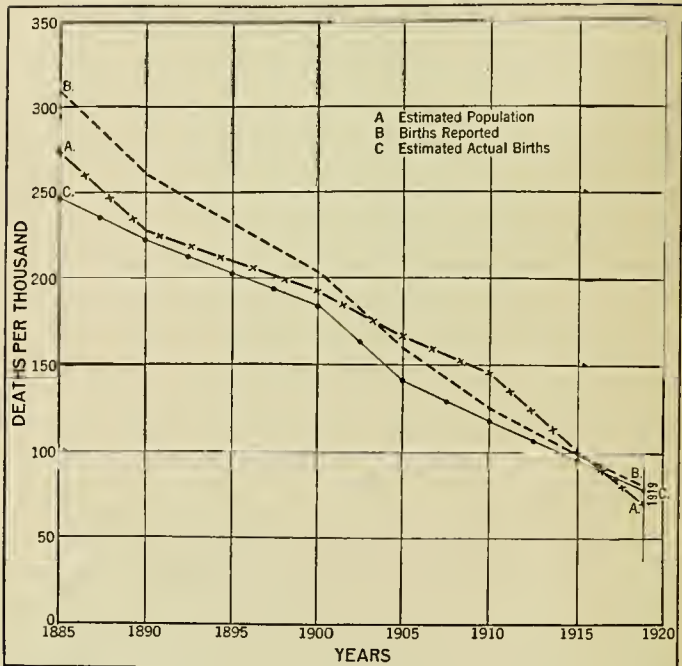


Fig. 2. The comparative rate of decline in the infant-mortality rate when based on the estimated population under one year of age (A); births reported (B); and the estimated actual births (C); during the period from 1885 to 1919

varying value which serve as its basis. Shortcomings in the census figures and limitations in the method of estimating the population under one year, as well as other considerations, contributed to this situation:

It is believed, however, that the chart serves

the purpose for which it was intended by showing that the rate of decline of the infant-mortality rate is not materially affected by use of one or another of the three bases referred to, and that throughout the period under consideration the rate of decline was continuous, striking, and approximately the same.

**A Broad View of the Infant-Life Preserving Forces.** The things which cause death may open up a suggestive vision of the things which

SAVING OF LIVES IN 1915 AND 1919 DUE TO INCREASED SECURITY OF INFANT LIFE SINCE 1885

Diseases Which Caused Death	For the Year 1915			For the Year 1919		
	Est'd No. Deaths in 1915 on 1885 Basis	Actual Deaths in 1915 <sup>1</sup>	Number Lives Saved	Est'd No. Deaths in 1919 on 1885 Basis	Actual Deaths in 1919	Number Lives Saved
<b>Total . . . .</b>	<b>37,696</b>	<b>13,866</b>	<b>23,830</b>	<b>41,410</b>	<b>10,639</b>	<b>30,771</b>
Contagious..	2,868	518	2,350	3,151	251	2,900
Diarrheal...	11,613	3,173	8,440	12,757	2,067	10,690
Respiratory.	5,819	3,117	2,702	6,392	2,015	4,377
Congenital..	5,794	5,525	269	6,365	4,852	1,513
All others...	11,602	1,533	10,069	12,745	1,454	11,291

<sup>1</sup> Obtained from *New York City Bureau of Records 74-1-1915*.

save life. With this in mind there is presented on page 17 a table which shows the number of infant lives saved in 1915 and 1919, expressed in terms of the four most important causes of infant deaths. The figures given there apply to the City of New York as a whole, the first column showing the number of deaths which would have occurred in 1915 if living conditions for infants had not changed since 1885.

The percentage of reduction in mortality from each of the important causes for the same period is shown in the table on page 19.

**The Saving of Infant Lives through Control over Contagious Diseases.** As is well known, great strides forward have been made, particularly in the last twenty-five years, in preventing the spread of contagious diseases, in immunization against such diseases, and in curing those who fall sick from them. The infant, no less than the adult, has benefited richly. The agencies through which this great life-saving force expressed itself are, in the main, the public health authorities of the city, the great army of private practising physicians, and the individuals in their homes who, through an educated public opinion, grow constantly better able to protect themselves.

The decline in the death rate from contagious



INFANT MORTALITY IN NEW YORK CITY 19

DECLINE IN THE DEATH RATE FROM THE FOUR PRINCIPAL CAUSES OF DEATH DURING THE PERIOD 1885-1915

Diseases Which Caused Death	1885		1915 <sup>1</sup>		Per Cent of Reduction
	Number of Deaths <sup>2</sup>	Mortality Rate <sup>3</sup>	Number of Deaths <sup>4</sup>	Mortality Rate <sup>5</sup>	
<b>Total . . . . .</b>	<b>9,303</b>	<b>273.60</b>	<b>13,866</b>	<b>100.62</b>	<b>63.22</b>
Contagious. . .	708	20.82	518	3.75	81.98
Diarrheal. . . .	2,866	84.28	3,173	23.02	72.68
Respiratory. . .	1,436	42.23	3,117	22.60	46.48
Congenital. . . .	1,430	42.05	5,525	40.09	4.66
All other. . . . .	2,863	84.20	1,533	11.12	86.79

diseases is shown graphically in Figure 3,<sup>6</sup> page 20. As appears from the table given above,

<sup>1</sup> A comparative table covering the years 1910 to 1919 appears in Appendix VI, page 131.

<sup>2</sup> *New York City Department of Health 50-1-1915.*

<sup>3</sup> The mortality rates for the various disease groups were obtained from the reported infant deaths of each group and the estimated population under one year, the latter being computed from the total reported infant deaths and the published infant-death rate for the year 1885 (*Billings 82-9-1894*).

<sup>4</sup> *New York City Department of Health 74-1-1915.*

<sup>5</sup> The mortality rates for the various disease groups were secured from the reported infant deaths of each group and the estimated population under one year of age for 1915 (*Guilfoy 72b-1-1916*).

<sup>6</sup> The old City of New York (Manhattan and the Bronx) is used as a basis throughout.

this decline was no less than 81.98 per cent during the past thirty-one years, and in 1915 represented a saving of some 2,350 infant lives on the basis of 1885 conditions. All the conquests in

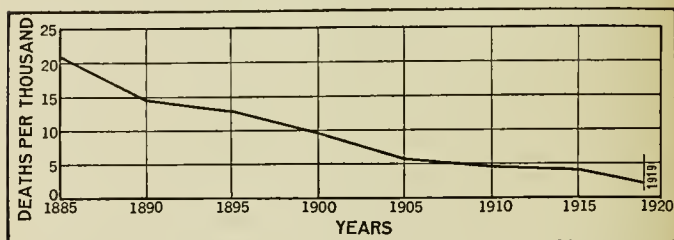


Fig. 3. Decline in the infant-mortality rate due to contagious diseases, Manhattan and the Bronx, period from 1885 to 1919. Based on Appendix V, page 130

this field have by no means yet been made. This great force will continue in the future to do its share in further lowering the infant-mortality rate of the city, even though it be in a less striking manner than in the past.

**Saving of Infant Lives through Control over Diarrheal Diseases.** Figure 4, page 21, shows graphically the decline in the death rate from diarrheal diseases.<sup>1</sup> As already shown on page 17, improvement in those conditions which cause diarrheal diseases among infants led to the saving of 8,440 lives in 1915 on the basis of 1885

<sup>1</sup>The old City of New York (Manhattan and the Bronx) is used as a basis throughout.

conditions. The most important of the factors which contributed to this result are suggested below.

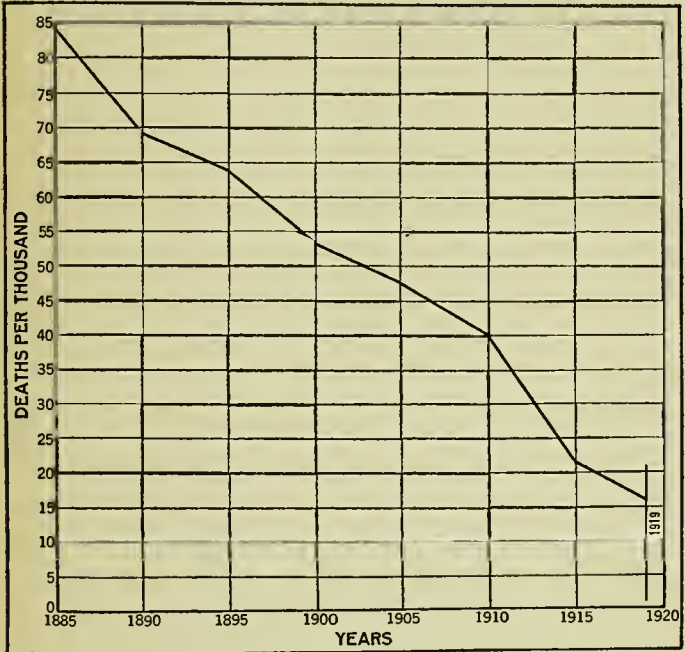


Fig. 4. Decline in the infant-mortality rate due to diarrheal diseases, Manhattan and the Bronx, period from 1885 to 1919. Based on Appendix V. page 130

**Pure Milk.** Milk, as is well known, is the great medium through which these diseases occur. Progress in the purification of the milk supply of the city seems to be synchronous with the decline of the infant-mortality rate from

diarrheal diseases. The system of grading; the efficiency of inspection at the source of production, at points of shipment, and during transportation and distribution in the city; the requirement of labeling; the sampling, followed by bacteriological and chemical examination—all work done with much credit by the local department of health—have combined to give the city its present high standard of milk supply.<sup>1</sup>

It is a long step from the conditions of 1842, when the greater part of the city milk supply came from two thousand cows kept in sheds of indescribable filth located at Ninth Avenue and Eighteenth Street and fed on cheap distillery waste, to the present system of pasteurized and graded milk supplied in well-secured bottles.

Step by step the city has fought for better milk. About 1880 milk inspection on a small scale was started; by 1892 sterilization was resorted to in a limited way in tenement districts; in 1895 followed a definite chemical standard; in 1896 came the license system, the first step toward successful control of the milk supply; in 1900 a bacteriological standard was adopted, which, however, did not prove adequate; in 1904

<sup>1</sup> A more detailed statement of the development of supervision over the city milk supply may be secured by application to the Library of the Rockefeller Foundation.

a maximum temperature for milk in transportation was established; in 1902 the first country inspector made investigations of sources of milk; in 1903 and 1904 special bacteriological studies were made through a grant from the Rockefeller Institute; in 1905 systematic inspection of creameries was introduced; in 1907 came the score card; in 1908, the first important regulations governing pasteurization of milk and the definition of *certified*, *inspected*, and *guaranteed* milk; in 1909 pasteurization was required for all but special types of milk; in 1912 the system of milk grading was introduced; and in 1914 came the requirement of universal pasteurization for all milk except that from tuberculin-tested herds.

It is probably not an exaggeration to say that the interest and enthusiasm displayed by numerous private organizations and individuals was the controlling factor which year by year forced increased municipal supervision over the milk supply. As early as 1873 the New York Diet Kitchen Association established a milk station. In 1892 Nathan Straus put in operation six milk depots where pasteurized milk could be purchased at less than cost. In 1906 the New York Milk Committee was created.

No statistical data are available from which

may be estimated the influence of the improved milk supply which New York City enjoyed in increasing measure with the passing of the years. Those closely in touch with the situation differ widely on this point. Certain it is that the milk supply changed from one generally considered highly unsafe during the early part of this period to one generally considered safe in all parts of the city at the present time. The city health authorities, specifically those having direct charge of the supervision of the milk supply, necessarily had the most important rôle in this work, which, however, probably could not have been undertaken so quickly or so effectively as it was without the continued interest and hearty support of numerous private agencies.

Within very recent years, through the inauguration of intensive, personal, educational work by milk-station and home-visiting nurses, an additional safeguard was thrown about the infant-milk supply, in that mothers were taught how to protect their babies from impure milk, how to improve pure milk by modification, and how further to safeguard the infant by feeding it at the proper time and in the proper way. This work, which is of great importance at the present time, was in earlier years done on so small a scale as to have been an almost negligible

factor. The improvement in the purity of the milk supply, on the other hand, was undoubtedly a vital factor as an infant-life preserving force throughout this period.

**Municipal Sanitation in Its Relation to Infant Mortality.** It is well known that with the improvement of municipal sanitation infant-mortality rates go down. The paving of streets, the proper cleaning of streets, the proper collection and disposal of garbage, ashes, and rubbish—all have a vital bearing on infant deaths.<sup>1</sup> The paving of New York City streets, begun extensively in 1890, was continued throughout the next decade. It is stated that between 1898 and 1903 two-thirds of the present asphalt pavement was laid. In 1895 an effective street-cleaning system was put in force. Probably of still greater importance is the fact that garbage and refuse came to be collected with greater system and greater thoroughness.

The improvement of the sewage and water-

<sup>1</sup> The Forty-Second Annual Report of the Local Government Board of London, on infant mortality, for the year 1912-1913, contains the following on this point: "It can be claimed, with high probability, that the recent fall in the infant mortality figure is the result of improved sanitary and housing conditions, of more efficient municipal and domestic cleanliness. . . . Unpaved yards and streets and inefficient scavenging favor excessive infant mortality."

supply systems of the city undoubtedly also was a factor. The reduction in the number of open surface privies within city limits was of importance.<sup>1</sup>

Unclean streets and unclean premises mean unclean homes and unclean milk. Human beings by no means are the only mediums for the spread of uncleanness to milk and babies. They are probably of less importance than are house flies, the relation of which, particularly to diarrheal diseases, is a well-established fact.<sup>2</sup> House flies, as is well known, breed in great numbers, and thrive in the sort of refuse that litters unclean premises and unclean streets.

**Breast Feeding.** At first thought every increase in breast feeding would seem to remove the necessity of an improved milk supply, in that it tends to remove the need for other than mothers' milk. It may be, however, that a pure-

<sup>1</sup> "In the history of several towns, the conversion of a conservancy (surface privies) into a water-carriage system has been associated with a great reduction of mortality from diarrheal diseases, whilst in other towns the continuance of conservancy systems has been associated with continued high diarrheal mortality." (*Great Britain Local Government Board 23-88-1913.*)

<sup>2</sup> In this connection see *Flies and Diarrheal Disease*, by Dr. Donald B. Armstrong, Publication No. 79 of the N. Y. Association for Improving the Condition of the Poor.



milk supply largely retains its importance even where breast feeding is practised. Situations will repeatedly arise when the mother is not able to breast-feed her child, and resort is then had to the bottle. In 1914, 62.4 per cent of all infants enrolled at milk stations were entirely breast fed (*Baker 31-62-1915*). It is a fact that one meal of impure milk may lead to serious complications. Frequently, also, the bottle milk will not be properly prepared, owing to lack of practise or understanding on the part of the mother, or, in her absence, on the part of the one who may be entrusted with the temporary feeding. Other children, and sometimes small children at that, seem often to attend to this.

**Saving of Infant Lives through Control over Respiratory Diseases.** Improvement in those conditions which cause respiratory diseases among infants led to a saving of 2,702 infant lives in 1915 on the basis of 1885 conditions. The factors which contributed to this decline have not been adequately identified. Supplying pure air and plenty of sunshine under proper conditions is obviously the most important task in reducing mortality from this cause. Tenement-house legislation and inspection, ener-

getic fresh-air campaigns, recreation piers, park spaces, improved street cleaning and sprinkling, and a widening popular reaction to health education would seem to be factors which in recent years have contributed to this result.

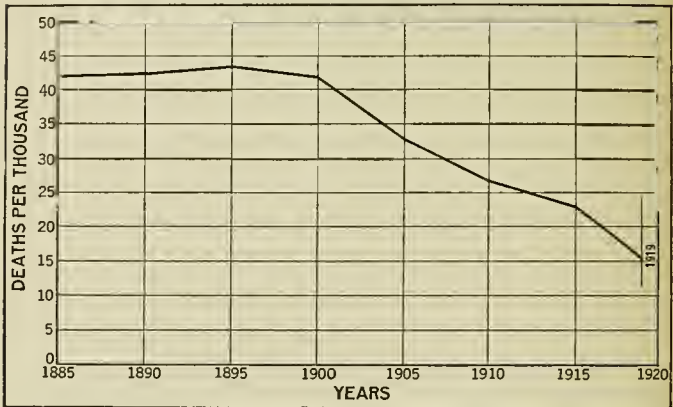


Fig. 5. Decline in the infant-mortality rate due to respiratory diseases, Manhattan and the Bronx, period from 1885 to 1919. Based on Appendix V, page 130

Figure 5 shows the movement of the rate from 1885 to 1919. It will be noticed that up to 1900 the rate remained about the same; then began a fairly sharp decline, which continued throughout the balance of the period.

**Saving of Infant Lives through Control over Congenital Diseases.** The past thirty years seem to have brought little improvement

in the conditions which cause death from congenital diseases. The table on page 17 shows a saving of only 269 lives on the basis of 1885 conditions. Figure 6 illustrates the situation very well. The rise in mortality from 1885 to

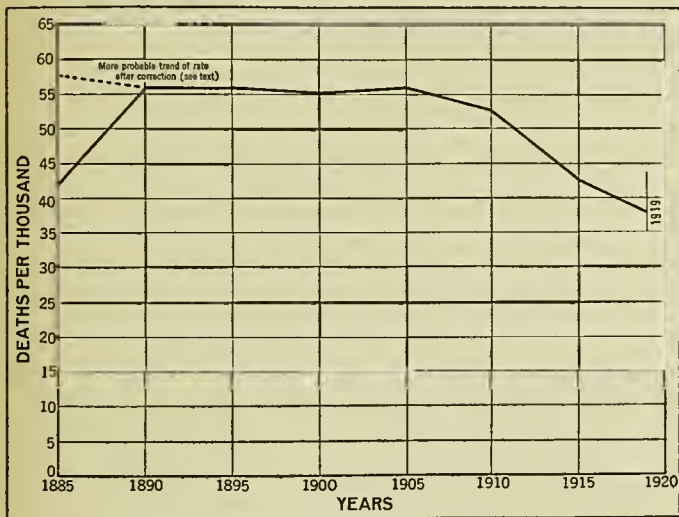


Fig. 6. Decline in the infant-mortality rate due to congenital diseases, Manhattan and the Bronx, period from 1885 to 1919. Based on Appendix V, page 130

1890 may be charged to ineradicable statistical inaccuracies. Up to 1910 the rate remained about the same. During the next five years a fairly sharp decline took place. No satisfactory explanation has been found for this decline. Everything that counteracts careless dressing,

eating, and living on the part of expectant mothers, that reduces alcoholism and social diseases, and lessens the indulgence in excesses of all kinds, also reduces infant deaths from this cause. Undoubtedly the influence of the health-educational campaign is beginning to make itself felt, particularly through an appreciation of the importance and dangers of all forms of excesses.

The work of prenatal nurses, also, is probably to some extent leaving its imprint.<sup>1</sup> In 1911 the New York Milk Committee began an experiment looking to a reduction in the death rate due to congenital diseases, by employing a number of nurses who devoted their time to the education of expectant mothers. In 1914 this work was taken over by the Bureau of Child Hygiene, which until 1915 employed seven nurses all the year round, and after that eight nurses. Effective educational work by the Bureau of Social Hygiene, as well as by various other philanthropic agencies, is probably also a factor.

**Saving of Infant Lives through Control over Diseases Included in the "All Other" Group.** By reference to Figure 7 it will be seen that there has been a marked decline in that

<sup>1</sup> Details concerning this work may be secured from the Library of the Rockefeller Foundation.

group of infant diseases not included under the four preceding headings. This group includes the following: tubercular meningitis, simple

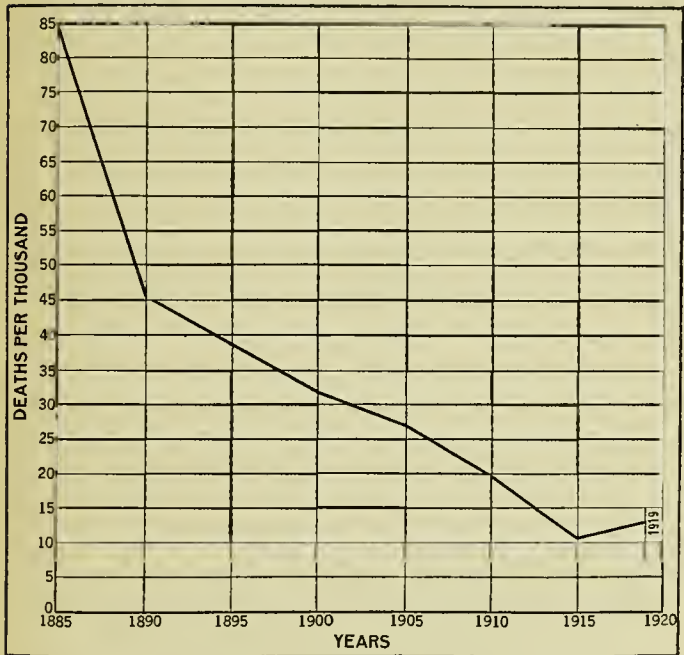


Fig. 7. Decline in the infant-mortality rate due to diseases other than those classed as contagious, diarrheal, respiratory, and congenital, Manhattan and the Bronx, period from 1885 to 1919. Based on Appendix V, page 130

meningitis, convulsions, congestion of the brain, pulmonary tuberculosis, erysipelas, syphilis, and numerous others.

The decline in the death rate from these various diseases, as shown in the chart, is undoubtedly an exaggeration, in that improper diagnosis in the early years of this period unquestionably led to the inclusion in the "all other" class of many deaths that should properly have been charged to the four important groups heretofore discussed. From time to time there have also been changes in definition and classification.<sup>1</sup> In interpreting the various charts shown, it would therefore seem necessary to picture the decline in rate due to the four principal causes as being somewhat greater, and the decline in rate for the class of "all other" diseases as being somewhat less, than shown. The chart is considered of importance in showing the movement of the mortality rate in that group of infant diseases which are individually of minor, but collectively of much, importance, and some of which lie on the borderland of the four great groups.

**Change in the Racial Composition of the Population in Its Relation to Infant Mortality.** On preceding pages have been suggested numerous factors which have had a varying in-

<sup>1</sup> A standard system of classification of causes of death, known as *The International List of Causes of Death*, is now in general use throughout the United States and in foreign countries.

fluence on the decline in the infant-mortality rate of the city. It was not possible by means of statistical investigation to determine even with approximate accuracy the relative influence which one or another of these factors may have had in the improvement of living conditions for infants. There remains one factor, however, concerning which, fortunately, material of some definiteness has recently been made available, thanks to a timely study by Dr. William H. Guilfooy, Registrar of Records of the New York City Department of Health. This is the influence of the change in the racial composition of the population of the city, due to the large stream of immigration which has reached the city. That the infant-mortality rate among infants of different races varies considerably has been well established. The extent to which this is true is reflected by the table on page 34.

From this table it appears that 36,992 infants were born in 1915 to parents one or both of whom were native-born Americans. In the same year no less than 29,717 infants were born to Italian parents, 24,432 to Russian-Polish parents, and 11,797 to Austro-Hungarian parents. The Austro-Hungarians and Russian-Poles were almost entirely Jews. The infant-mortality rate for the

DEATHS OF CHILDREN UNDER ONE YEAR OF AGE ACCORDING TO NATIVITIES OF ONE OR BOTH PARENTS—  
DEATH RATES PER 1,000 BIRTHS REPORTED BY NATIVITIES OF ONE OR BOTH PARENTS, 1915<sup>1</sup>

Country	Births Reported, by Nativities of One or Both Parents	Deaths under One Year, by Nativities of One or Both Parents	Death Rate per 1,000 Births Reported, by Nativities of One or Both Parents
<b>Total</b> . . . . .	<b>141,256</b>	<b>13,866</b>	<b>98.2</b>
United States . . . . .	36,992	3,935	106.3
Italy . . . . .	29,717	3,068	103.2
Russia-Poland . . . . .	24,432	1,903	77.9
Austria-Hungary . . . . .	11,797	942	79.8
Ireland . . . . .	5,027	600	119.3
Germany . . . . .	1,903	220	115.6
England . . . . .	486	67	137.9
Sweden . . . . .	550	36	65.5
Bohemia . . . . .	237	32	135.0
Scotland . . . . .	202	16	79.2
Switzerland . . . . .	45	10	222.2
France . . . . .	100	8	80.0
Other foreign . . . . .	} 29,768	3,029	101.8
Mixed (native and foreign) . . . . .			
Unknown . . . . .			

year 1915, including all races, was 98.2 per thousand. The rate among infants classed as American born, that is, with one or both parents American, was 106.3 per thousand; that among

<sup>1</sup> *Guilfoy 30-10-1917.*



infants belonging to other races was: Italians, 103.2 per thousand;<sup>1</sup> Austro-Hungarians, 79.8 per thousand; and Russian-Poles, 77.9 per thousand. Dr. Guilfoyle makes the striking statement that if the births and deaths of infants born to Austro-Hungarian and Russian-Polish mothers are excluded from consideration, the infant-mortality rate of the city during the year 1915 becomes 105 instead of 98.2. The statistics for the year 1917 bring out the same point.<sup>2</sup> The infant death rate for that year for the city was 88.8 per thousand. If infants of Russian-Polish and Austro-Hungarian nativity be excluded, the rate for this year advances to 96.07.

It would appear that the racial factor was even more important than is indicated by the statistics of the Department of Health. The rate of 106.3 per thousand among infants classed as American born includes infants born of parents one of whom may have been foreign born. It is well known, of course, that many foreign women marry American men, and vice versa.

<sup>1</sup> The rate for infants of Italian parentage is considerably higher than that for infants of Austro-Hungarian origin largely because of the influence of the death rate in the group of contagious and respiratory diseases, particularly the latter. Italian infants are subject to a considerably higher rate in these two groups than are infants of American parentage.

<sup>2</sup> See Appendix X, page 135.

On the strength of the statistics already presented it seems entirely plausible that the infant-mortality rate among infants born to parents one of whom (and particularly the mother) is of foreign nativity, would tend to be lower than among infants born to parents who are both American born. Hence the death rate among infants both of whose parents are American born is undoubtedly higher than 106.3 per thousand.

The statistical investigations of the Department of Health also revealed the fact that the racial factor favorably influenced the infant death rate in each of the five groups of infants' diseases which have been discussed. Inspection of the table which appears on page 38 shows the degree of this influence in a single group—congenital diseases. The table presented in Appendix IX, covering deaths from all causes among children under five years of age,<sup>1</sup> and the table presented on page 38, covering congenital disease rate among infants under one year of age, permit of certain deductions. In the first place it would seem that the influence of the racial factor was most marked in the groups of diarrheal and congenital diseases.

<sup>1</sup> See Appendix IX, page 134, for a table covering deaths among children under five years of age, classified by nationality of mother and cause of death.

In these two groups the mortality rate among infants representing each of the foreign race groups was lower than that among infants born to American parents. In the groups of contagious and respiratory diseases, on the other hand, we find that infants of Italian nativity were subject to a considerably higher rate than were infants born to American parents. The difference in the rates here is striking. The adverse effect on the death rate caused by infants of Italian parentage is, however, more than counterbalanced in these two groups by the remarkably low rates prevailing among infants whose parents were of Russian or Austro-Hungarian nativity—mostly Jewish.

From the point of view of the present study of the decline of the infant-mortality rate, the factor of race changes in the population acquires significance largely because the ratio of different races to one another did not remain the same throughout the period studied. Russians, Poles, Austrians, and Italians have entered this country in increasing numbers from year to year, particularly since 1900. The foreign white population of the city increased by 32.97 per cent in the decade from 1890 to 1900, and by 50.14 per cent in the decade from 1900 to 1910. In actual number the increase during the decade

INFANT MORTALITY ACCORDING TO NATIONALITY OF MOTHER, FROM CONGENITAL DISEASES, PER 1,000 BIRTHS REPORTED. BOROUGH OF MANHATTAN, YEAR 1915<sup>1</sup>

Nationality	Total Births Reported	Deaths from Congenital Diseases	
		Number	Rate
All nationalities . . . . .	65,418	2,795	42.7
United States . . . . .	17,210	937	54.4
Ireland . . . . .	4,304	228	53.0
Germany . . . . .	1,299	75	57.7
Italy . . . . .	14,946	442	29.5
Russia . . . . .	12,217	392	32.0
England . . . . .	696	33	47.4
Austria-Hungary . . . . .	9,927	282	28.4
British America . . . . .	1,111	9	8.1
Switzerland . . . . .	92	6	65.2
France . . . . .	203	12	59.1
Bohemia . . . . .	272	14	51.5
Sweden . . . . .	360	14	38.9

from 1900 to 1910 was from 1,260,918 to 1,927,703.<sup>2</sup>

<sup>1</sup> (*Guilfoyl 30-11-1917.*) It is highly unfortunate that the Department of Health did not publish similar analyses covering the deaths in other groups of infants' diseases, notably diarrheal and respiratory diseases. A table covering deaths among children under five years of age, classified in this manner, was, however, published. It appears as Appendix IX, page 134.

<sup>2</sup> From *Changed New York*, published in 1914 in volume 6 of the New York Federation of Churches Bulletin, edited by Dr. Walter Laidlaw.

This increase in the foreign element of the city tended to *accelerate* the rate of decline of the infant-mortality rate. It is customary to attribute every decrease in the death rate to an improvement in health conditions. In this case, however, a not inconsiderable part of the decrease in the infant-mortality rate which occurred in the city during this particular period must be credited to a change in the racial make-up of the city, and so does not in any way reflect an improvement of health conditions for infants. It is necessary to discount the extent of improvement of health conditions to the degree in which the racial factor magnified the actual reduction which took place in the infant-mortality rate.<sup>1</sup>

<sup>1</sup> It is to be regretted that statistics on the same point are not available for Chicago, Philadelphia, and Boston, which have had somewhat similar experiences with immigration. It would be important also to know how far the influence which immigration may have exerted in these cities was accentuated or offset by other factors affecting the security of infant life.

Further investigation in this direction is needed. Until this has been made, the statistics here presented of the experience of New York City must be interpreted from a purely local point of view.

## II

### INTENSIVE EFFORT TO REDUCE INFANT MORTALITY

Specialized Infant-Welfare Work in Its Relation to the Decline of the Infant-Mortality Rate. On preceding pages an attempt was made to describe briefly some of the large forces which were called into existence after 1885, and which had much to do with the reduction in infant mortality. These forces also brought about other marked improvements in public health and sanitation. In fact, their contribution to infant-life saving, large though it was, may be looked upon as an incidental one. As pointed out on page 17, had conditions remained the same in 1915 as in 1885 the total number of deaths among infants in New York City would have been 37,696. As a matter of fact the city lost but 13,866 infant lives, so that no less than 23,830 lives were saved as a result of an improvement in conditions affecting infant life which had been brought about since 1885.

The question may be asked: What part has intensive infant care, as given by a large number

of organizations, played in this work of life-saving? It is proposed in succeeding pages to explain the various steps in the investigation through which an answer was sought to this question—in particular, with respect to work accomplished by the baby health stations and by the home-visiting nurses of New York City—and the approximate proportion of the life saving effected through these agencies to the total saving of 23,830 infants' lives in 1915, to which reference was just made.

It must be quite evident to any one giving the matter careful thought that the conquest of contagious diseases benefited everybody, both young and old, and that the credit for infant-life saving in this field belongs very largely to public health officers, and to the large army of private, practising physicians who had acquired increasing knowledge of the means whereby immunity may be secured or the disease made harmless through serums, antitoxins, or vaccines, or controlled in other ways. The provision of a pure milk supply was in part due to efforts lying wholly outside of infant-welfare organizations, although much credit for the splendid accomplishments in this field must unquestionably be given to them. It is in this field, probably more than in any other, that the welfare agencies managed to leave their

influence. Improvement in street paving, cleaning, and sprinkling, in refuse collection, sewerage, and elimination of surface privies, in tenement-house inspection, the organization of poor relief, parking, and in the various other activities which vitally affected municipal sanitation and brought blessings of health to both old and young, is traceable very largely to effort and initiative on the part of agencies and influences wholly separate from those concerned with infant welfare. It is obviously impossible to dissociate by means of statistical processes the efforts made by child-welfare organizations from those made by other agencies in such manner as to bring out the achievements in infant-life saving accomplished through either group.

**Information Available in Department of Health Concerning Extent of Life Saving by Child-Welfare Agencies.** A great deal of current material is issued from time to time in the weekly reports of the Babies' Welfare Association which are published by the Department of Health. According to this publication, the number of "babies reached by milk stations" in 1915 was 61,275. On inquiry at the Department it was found, however, that but 37,197 of this number were infants under one year of age, that



8,865 were between one and two years, and that the rest consisted of several thousand children and adults. The Department also has published information on the number of deaths among infants enrolled at milk stations, the *total deaths* among *babies reached* being given. On inquiry it was found that these total deaths do not include all the deaths among infants enrolled; they omit deaths from contagious disease and from accidents. This fact was, however, not set forth in the publication. Since the statistics of *babies reached* included, in addition to infants under one year, those under two years, as well as children and adults, they obviously had no value whatever as a basis for the calculation of an infant-mortality rate. On the contrary, they were apt to mislead those who were not specially informed.<sup>1</sup>

It is of interest that the Department has not published an infant-mortality rate in connection with the statistics contained in its weekly reports. It has, however, from time to time, issued statements concerning infant mortality among infants cared for. Thus, in the annual report for

<sup>1</sup> Statistics covering the number of babies reached during the years 1916, 1917, 1918, and 1919 are shown in Appendix I, page 120. Since 1915 the Department of Health has introduced the necessary age classification.

1914, it is stated that "during the year [1914] there have been 40,000 babies in attendance at the milk stations, with a death rate of about 1 per cent."<sup>1</sup> This would be at the rate of ten per thousand. The Department also stated that "it is a striking fact that during the month of July the 16,000 or more children who were observed by the district staff [*of home nurses*] suffered a mortality equal to less than twenty-three per thousand per annum."

**Necessity of Confining the Statistical Study to One Year.** Owing to the limitations of statistical records and the immense amount of work involved in their use, it was not found practical to attempt to inquire into the results of baby-health-station work covering a series of years. Attention was directed to what took place in 1915, this being the most recent year for which complete statistics were available.<sup>2</sup> In that year the city had fifty-nine stations in operation. It had entered the field of milk-station work in 1911 through the establishment of fifteen stations, and in 1912 had taken over from private agencies or had itself established forty more.

<sup>1</sup> *New York City Department of Health 32-80-1914.*

<sup>2</sup> This investigation was made in 1915 and the early part of 1916.

By 1915 these had been increased to fifty-nine, and by 1919 to sixty.

The investigation was largely confined to an effort to get at the actual mortality rate among infants cared for at baby health stations *during the period of care only*, and not after its termination. This latter fact needs to be emphasized. It was not possible to get the rate after termination of care, owing to the mobility of the population of the city and the difficulty of following up infants and determining accurately how many of them died. For the period of care, however, the history of each infant could be quite accurately studied with respect to the following: the number of infants enrolled, the length of the period of enrolment, the average age at which infants were enrolled and at which their enrolment was terminated, and the number of deaths during enrolment. With this information at hand it was possible to construct an infant-mortality rate which applied to infants cared for during the period of care. On the pages which follow an explanation will be given of just what calculations were made and of what steps were taken to arrive at each of the facts referred to.

**Determination of Average Enrolment of Infants at Baby Health Stations.** As already

stated, in the year 1915 the number of infants under one year of age enrolled at one time or another during the year was 37,197. Some were enrolled for but a few days, some for weeks, some for a number of months, and some for the entire year. The number of infants thus enrolled is quite correctly designated by the Department as *infants reached*. These infants represent 26.9 per cent of the total infant population of the city for 1915. This fact suggests that the work of the baby health stations exercises a wide influence on the infant population of the city. When we add to this number the infants reached by municipal home-visiting nurses, private milk stations, and private home-visiting nurses, as well as by other organizations, it will be seen that under existing conditions a very large proportion of the infant population of the city annually comes in touch, for a varying period of time, with the educational influences of the Bureau of Child Hygiene and affiliated infant-welfare agencies.

It must be quite clear that the 37,197 infants enrolled may not be used as a basis on which a mortality rate can be constructed, owing to the fact that these infants were reached by the stations during only a minor part of the year, and that the deaths which occurred among them dur-

ing that part of the year during which they were not enrolled are not included in the deaths reported by the Department as having occurred among infants cared for.

With a view to determining just what the equivalent of this total enrolment might be in terms of *infant-years*, that is, the enrolment of one infant for one year, a study was made of the conditions surrounding enrolment at the baby health station located at 244 Mulberry Street. This station had been recommended to the investigators by the Department of Health on the ground that it was a typical station with respect to the community in which service was given, the length of time during which the infants were enrolled, and the general health conditions and social factors affecting the infant. The 300 infants under one year of age who were enrolled at the station had been cared for for a grand total of 31,434 days, or an average of 104 days per infant. Caring for 300 infants for 104 days is equivalent, from the point of view of time, to caring for 86 infants for 365 days each, or for one full year; or, stated in another way, the total enrolment was equivalent to 86 *infant-years*, the term being understood to denote the care of one infant for one year. This is 28.66 per cent of the total number of infants reached

(300). Assuming that conditions at this station were typical of conditions elsewhere,<sup>1</sup> it follows that the equivalent of the enrolment of 37,197 infants at all city stations, expressed in infant-years, was 28.66 per cent of the total enrolment of 37,197, or 10,663. This latter figure, 10,663, represents a fairly sound basis for the calculation of an infant-mortality rate for infants while actually in the care of baby health stations. It was used for that purpose.

**Determination of Total Number of Deaths.** The Department of Health reported the total number of deaths among infants under one year of age enrolled at city stations in 1915 to have been 421 (*Sobel 52d-1-1916*). This figure, however, does not include deaths from contagious diseases and from accidents, which the nurses are not required to charge against their work, and which are published only at the end of the year. In order to get at the total number of

<sup>1</sup> This assumption has a much broader basis of fact than appears from the figures just given. In addition to the 300 infants enrolled at 244 Mulberry Street, 529 infants enrolled at two other stations and about 1,000 infants enrolled in Health District No. 1 were studied. The facts developed by this broader study, reference to which is made also on page 68, supported the assumption just made. The findings concerning Health District No. 1 are not presented in this report.

deaths caused by contagious diseases and accidents among infants enrolled, a study was made of the ratio which deaths from these causes formed to all other deaths among infants. For this purpose use was made of the vital statistics covering this point which are available for the infant population of the city as a whole. It was found that during the period of enrolment approximately nineteen deaths from contagious diseases and accidents had evidently occurred among the 37,197 infants enrolled. Hence the total number of deaths among these infants was apparently 421 plus 19, or about 440.

It is believed, however, that this is an understatement of actual mortality, and that the number of deaths among enrolled infants was higher than the figure just given. Various considerations suggest this. Baby health stations do not enroll certain classes of sick infants, but refer these to hospitals, private physicians, and other agencies. When infants fall sick with acute disorders while enrolled, they are referred as quickly as possible to doctors or hospitals. Unless the infant thus transferred dies within two weeks;<sup>1</sup> unless the nurse carefully follows up the

<sup>1</sup> Infants are considered as *enrolled* for two weeks after their last report to a station, so that this time is included in the period of enrolment.

infant, no matter to what part of the city it may be taken; unless the nurse is satisfied that the infant did not die from any contagious disease or from accident; and unless the nurse faithfully records such a death against her efficiency record, that particular death will escape being charged against the station. If an infant falls sick while enrolled and the mother refuses to return to the station within two weeks, but instead takes her baby to a doctor, the case is terminated as "under care of private physician." If such a baby dies, the death is not charged to the station. The records show a large percentage of terminations because of "refusal to attend" on the part of the mother. Some of these, it was established, were due to sickness of the baby. The records show further that a large percentage of mothers who have babies enrolled move from one district to another. It must be exceedingly difficult, among other duties, adequately to follow up infants for two weeks after the mother last came to the station. Keen rivalry exists among the nurses. All wish to make a good record for their stations. This situation, in face of the many existing loopholes through which chargeable deaths may be "lost" with but very slight chance of detection, must sometimes put to a severe test the honesty of a nurse.



In view of the large amount of labor involved in aiming to improve further the figures relating to deaths, it was decided that the purposes of the investigation might be adequately met by proceeding on the assumption that there had been but 440 deaths. The total enrolment at milk stations expressed in infant-years, as set forth on page 48, was 10,663. The mortality rate among infants cared for by baby health stations during the period of care was hence about 41.26 per thousand. This rate shows the work in a somewhat more favorable light than the actual situation deserves, because of the facts set forth in the preceding paragraph and because of the further fact that approximately 9 per cent of the infants enrolled at the Mulberry Street station during the summer months were found to be also enrolled with home-visiting nurses, so that the combined influence of these two agencies was expressed in their care, and, therefore, also in the death rate.<sup>1</sup>

<sup>1</sup> This practise is against the rules of the Department, but apparently it is difficult to avoid owing to subterfuges resorted to by mothers, who, among other things, want the benefit of free ice tickets from both sources. These and other considerations are brought forward without the slightest wish to minimize the value of work done through baby health stations. Their record is good as it stands.

**Determination of the Extent of Life Saving.** Having determined the mortality rate among infants cared for, it was next necessary to determine the mortality rate among infants not cared for who were living under the same general conditions and belonged to the same age-group. Both of these factors, obviously, are of extreme importance in an investigation of this character. The death rate for the city as a whole in 1915 was 98.1 per thousand. The baby health stations are, however, operated in areas where the death rates as well as the birth rates are higher than the average. They are located largely on the east side of the city. It was fortunate, from the standpoint of this investigation, that Manhattan is divided into 224 comparatively small health districts, and that most of the baby health stations are located in Manhattan and the Bronx. The city has kept an accurate record of vital statistics for each of these health districts. It has also divided the city into municipal milk-station districts, which are somewhat larger than the health districts. While a combination of health districts did not produce areas which were in all cases entirely coterminous with the milk-station districts, this end was approximately attained through a combination of rates in the health districts. The infant-mortality

rate in the milk-station districts was found to vary from 68.16 in District No. 13 to 247 in District No. 1. The average rate for the milk-station districts was found to be 106.84.<sup>1</sup>

It will be quite clear that this infant-mortality rate included the rate which prevailed among both the supervised and the unsupervised infants living in these areas. Obviously, the rate among the unsupervised was higher than that among the supervised. Since we knew the total number of infants living in the milk-station districts as well as the total number enrolled at baby health stations in these districts, and also knew the total number of deaths among all infants in these districts as well as the total number of deaths among those enrolled, a simple statistical process developed the fact that the mortality rate among unsupervised infants living on the East Side in Manhattan, where most of the milk stations were being operated, was about 116.6 per thousand.<sup>2</sup>

<sup>1</sup> See Appendix II, pages 121-127, for details.

<sup>2</sup> The total births reported in 1915 for the health districts (which were largely coterminous with the milk-station districts involved) was 46,562. The total enrolment of infants at baby health stations in these areas in the same year, expressed in terms of infant-years, was 5,641, so that the total number of unsupervised infants was about 40,921. The total deaths among the unsupervised were 4,775. The rate on this basis among the unsupervised was 116.6.

Offhand, it might seem as though we had now arrived at the point where a comparison might be made between the infant-mortality rate among infants enrolled at milk stations, which was found to be 41.26 per thousand, and the infant-mortality rate among unsupervised infants living under similar conditions, among whom the rate was found to be 116.6 per thousand. Another very important factor, however, remains to be considered, namely, that of age. The infants included in the unsupervised group were part of the general infant population, of which every infant, from the day of its birth, becomes a part. They represented all ages from one day to one year. The infants enrolled at the baby health stations of the city formed a distinct and specialized group. On an average, they were found to be no less than four and one-half months of age at the time of enrolment, and eight months of age at the time of termination of enrolment. It was furthermore found that the average age of these infants during enrolment was six and one-quarter months. Obviously, the infant-mortality rate among infants in this advanced age-group would be much lower than that among infants of all ages under one, as included in the general infant population of the city.

With a view to discovering what influence the

age factor had on the infant mortality, statistics that had been prepared by the Bureau of Records of the Department of Health were utilized. These figures show the mortality among infants

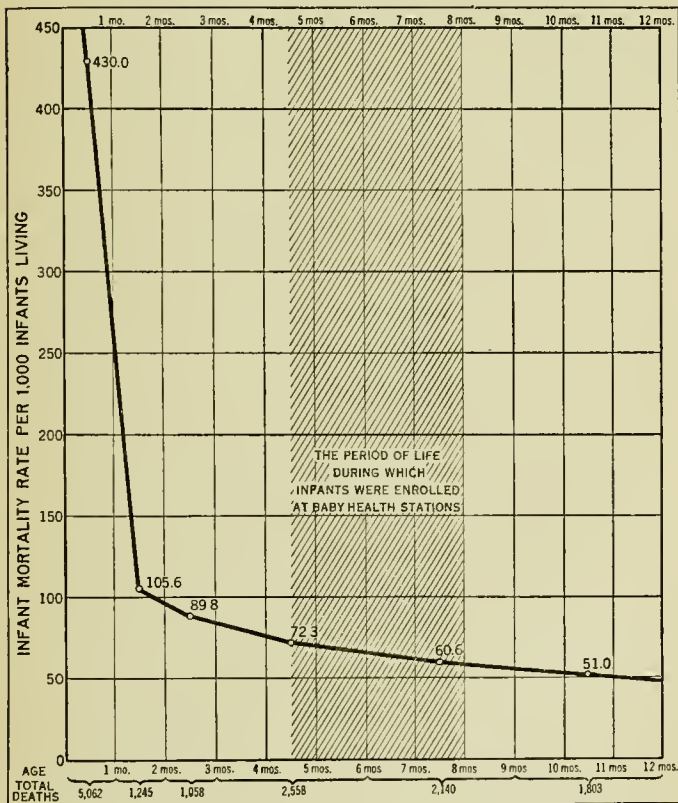


Fig. 8. Decline in the infant-mortality rate based on the number of deaths per thousand among infants grouped by age in months; and the rate in the period of life during which infants were enrolled at baby health stations

of succeeding age-groups up to one year. Figure 8, on the preceding page, presents graphically the interesting results of this study. It is based on the table on page 57.

An examination of this table shows that the infant-mortality rate among infants under thirty days of age was no less than 430 per thousand, and that there was a tremendous drop in mortality in the second month of infant life, the average for infants between thirty and sixty days of age being but 105.6 per thousand. From this period on, the mortality rate gradually declined until during the latter part of the year, the period from nine to twelve months, the average mortality in New York City was but 51 per thousand. That part of the line in the chart which is specially shaded shows the mortality rate among infants in the age-group during which they were found to be enrolled at the baby health stations. The actual rate for this age-group was found to be 65.6 per thousand.<sup>1</sup>

It is important, however, to bear in mind that this rate refers to conditions as they existed

<sup>1</sup> In the age-period from four and one-half to eight months, which corresponds to that in which infants were found to be enrolled at baby health stations, 19.51 per cent of all deaths of the year occurred. (See table, following page.) This is at the average rate of 772 deaths per month, or 9,268 deaths per year, and represents a rate of 65.6 per thousand.

DEATHS OF INFANTS UNDER ONE YEAR OF AGE IN NEW YORK CITY IN 1915, CLASSIFIED BY AGE IN MONTHS AT TIME OF DEATH <sup>1</sup>

Age under	Deaths		Mortality Rate for Each Age-Group per 1,000 Births
	Total Number	Per Cent of All Deaths	
1 month. . . .	5,062	36.50	430.0
2 months. . . .	1,245	8.97	105.7
3 months. . . .	1,058	7.63	89.8
4 months <sup>2</sup> . . . .	852	6.14	72.3
5 months <sup>2</sup> . . . .	852	6.14	72.3
6 months <sup>2</sup> . . . .	852	6.14	72.3
7 months <sup>3</sup> . . . .	714	5.14	60.6
8 months <sup>3</sup> . . . .	714	5.14	60.6
9 months <sup>3</sup> . . . .	714	5.14	60.6
10 months <sup>4</sup> . . . .	601	4.33	51.0
11 months <sup>4</sup> . . . .	601	4.33	51.0
12 months <sup>4</sup> . . . .	601	4.33	51.0

<sup>1</sup> The Bureau of Records of the Department of Health supplied death records for each of the first three months of life and grouped its information for the succeeding nine months in three-month periods, from three to six, six to nine, and nine to twelve. It was necessary to apportion these deaths arbitrarily by months within each of the last three groups. This accounts for the identity of the figures.

<sup>2</sup> The average number of deaths per month for the period from three months to six months of age is given, the total deaths for the three-month period numbering 2,558.

<sup>3</sup> The average number of deaths per month for the period from six months to nine months of age is given, the total deaths for the three-month period numbering 2,140.

<sup>4</sup> The average number of deaths per month for the period from nine months to twelve months of age is given, the total deaths for the three-month period numbering 1,803.

among the infant population of New York City as a whole. In the areas where the stations were operated conditions were somewhat different. Statistical data were lacking from which to construct a mortality rate among unsupervised infants belonging to the age-group of those supervised. However, by a simple process of statistical deduction, an approximate rate for this age-group was secured as follows: The infant-mortality rate for the city as a whole was 98.1 per thousand. The rate among infants of the age-group of those enrolled at milk stations, for the city as a whole, was 65.6 per thousand. Hence the injection of the age factor meant a reduction of 32.5 per thousand in the rate. It was assumed that in the case of unsupervised infants the injection of the age factor led to a similar reduction in mortality, that is, from 116.6 to 84.1. This figure probably is conservative, for the mortality among infants less than four and one-half months old in an infant population showing a death rate of 116.6 is probably greater than in the case of an infant population showing a death rate of but 98.1.

We have now arrived at the point where a general comparison can be made between the mortality rate among infants cared for and that among infants not cared for. The rate among



those cared for was found to be about 41.26 per thousand, with good reason for believing that it probably was higher. The rate among those not cared for, but belonging to the same age-group and living under conditions approximately similar, was found to be about 84.1. Evidently, by virtue of enrolment with the baby health stations, there was a reduction in mortality of about 42.84 per thousand. In view of the fact that for the calendar year 1915 the average period of enrolment of 37,197 infants was but 104 days, this reduction of 50.9 per cent in the mortality rate may truly be described as remarkable.

On the basis of an enrolment, in terms of infant-years, amounting to 10,663, and a saving per thousand infants enrolled of 42.84 lives, it would seem that as a result of the work done by the fifty-nine baby health stations operated by the city in 1915 approximately 457 lives of infants under one year of age were saved during the period of enrolment. This saving in lives meant a reduction in the mortality rate of the city of about 3.29 per thousand living births.<sup>1</sup>

<sup>1</sup> Other life saving took place and other important benefits were conferred; see in this connection pages 96-98.

Saving in Infant Lives by Municipal Baby Health Stations during the Home-Visiting Period from July 3 to September 11. This inquiry was undertaken in the hope of developing material for comparison with the work of home-visiting nurses. As a first step a study was made of infants under one year of age enrolled at the typical station of 244 Mulberry Street during the seventy-one days from July 3 to September 11, 1915. One hundred forty-five infants were on the rolls for a total of 6,352 days. This enrolment in terms of infant-years was eighty-nine, or 61.3 per cent of the total number of infants reached at one time or another during this period. By applying this percentage to the total number of infants reached by all of the city milk stations during the seventy-one days, namely, 17,966, an equivalent of 11,013 in infant-years is secured. A total of 139 deaths occurred among these infants. This represents a mortality rate of 64.87 per thousand.

Although in 1915 the infant-mortality rate for the city as a whole was 98.1, it is clear that for the summer months this rate must have been considerably higher. The rate among the unsupervised infants during this summer period was obtained as follows: The rate among all infants in the city during the summer period, according

to the departmental records, was 121.8 per thousand. Clearly, the rate among infants living on the East Side was considerably higher. From the statistical studies already made and referred to on page 53, it was determined that the rate among infants living on the East Side was about 106.84, or 8.74 per thousand higher than the rate for the city as a whole, which was 98.1 per thousand. Assuming that this difference prevailed in the summer as in the rest of the year, the rate on the East Side during the summer months must have been at least 121.8 plus 8.74, or 130.54 per thousand. This is the rate among both the supervised and the unsupervised living on the East Side. It was found on page 53 that the rate among the unsupervised was 116.6, as against 106.84 for both supervised and unsupervised, a difference of 9.76 per thousand. Assuming the same difference to have existed during the summer months, it is evident that the rate among the unsupervised infants living in the milk-station areas on the East Side, during the seventy-one-day summer period from July 3 to September 11, was about 140.3 per thousand (130.54 plus 9.76).

All ages are represented in this rate of 140.3 per thousand. The infants cared for at city

stations were on an average five months old on enrolment and six and one-half months old at termination of enrolment. The average age during the period was five and three-quarters months. For this age-group the average mortality rate of the population of the city as a whole, calculated by use of the method already described in the footnote on page 56, was 65.6 per thousand. Since the general infant-mortality rate was 98.1, the injection of the age factor meant a reduction of 32.5 points per thousand in the rate. Assuming that the age factor represented a similar reduction among infants subject to the rate of 140.3 per thousand, it follows that the rate among infants of the same age-group as those cared for by the baby health stations was 107.8 per thousand. This rate takes into account the conditions under which the infants were living and also the age factor. Since the rate among infants cared for at stations was about 64.87 per thousand, there must have been a saving of about 42.93 per thousand infants enrolled. The average enrolment in terms of infant-years was 11,013. From this it follows that during the seventy-one-day period of baby-health-station work in the summer of 1915 about ninety-two lives were saved among all infants

enrolled, during the period of actual enrolment.<sup>1</sup>

How the Saving of Infant Lives Was Brought About at Municipal Baby Health Stations.<sup>2</sup> The influence for better health which the baby health stations were able to exercise had to be exerted during the rather brief period in which the infants were enrolled at these stations. This enrolment averaged about 104 days, or approximately three and one-half months.<sup>3</sup>

The care given to infants during the period of enrolment included: (1) medical examination at time of enrolment; (2) prescription of an individual formula for milk modification; (3) instruction in milk modification at the station or in the home by the station nurse; (4) sale of

<sup>1</sup> It should be emphasized that mathematical accuracy is not claimed for these figures. The assumptions made are open to criticism on the basis of any such claim. It is believed, however, that the picture presented is approximately correct; even a fifty-per-cent allowance for error, for the sake of argument, will in no way affect the general deductions. See also pages 96-98.

<sup>2</sup> Further details on the operation of both municipal and private baby health stations may be secured by application to the Library of the Rockefeller Foundation.

<sup>3</sup> This figure should not be confused with the average length of time during which infants were found to be enrolled in various years, or until they became two years of age, and which was 200.2 days. From details on page 67, the distinction will be clear.

“Grade A” pasteurized milk by a private milk company at the milk station; (5) urging the importance of breast feeding and leaving with the mother a copy of *Ten Reasons Why a Mother Should Nurse Her Baby*; (6) visits to the home by the nurse from time to time to see that milk modification was understood, and to inform the mother about general infant care and home hygiene; (7) a weekly clinic for all infants enrolled, including physical examinations, weighing, etc.; (8) visits to the home by the doctor, when necessary; and (9) treatment of infants suffering from non-acute, temporary gastro-intestinal disorders by station physicians at station clinics, or, if necessary, in the homes, the station nurses acting under the station doctor’s orders. The outstanding service is personal instruction.

It was by rendering services of this type for an average period of three and one-half months that the infant-mortality rate among those enrolled was reduced by 50.9 per cent, or from 84.1 to 41.26 per thousand.<sup>1</sup>

In addition to life saving, the baby-health-station work means stronger bodies and minds on the part of those who receive the benefit of

<sup>1</sup> It should be remembered always that this represents the very utmost that can be claimed for baby health stations.

this special care. Mothers once taught how to care better for their babies will use their new knowledge when other babies come. The Little Mothers are taught duties of the future. In minor ways, also, the educational and other work done through the medium of baby health stations unquestionably radiates among a considerable additional portion of the population. The real, immediate, and vital significance of the stations seems, however, to be expressed in the reduction of the infant-mortality rate, to which reference has already been made.

**Length of Enrolment Period.** The table on page 66 shows the result of a study made to determine the average length of time during which infants are enrolled at milk stations. The history of 417 infants on the rolls of 1914 was traced back to learn when they were enrolled, and traced ahead to learn when enrolment was terminated. It was found that 319 of those supervised in 1914 had been enrolled during the year; that 90 had been enrolled in 1913; and 8 in 1912. It was found further that the eight enrolled in 1912 were terminated in 1914; that eighty-one of the ninety enrolled in 1913 were terminated in 1914; and the remaining nine in 1915. No less than 209 of the 319 en-

rolled in 1914 were terminated in the same year, whereas 88 of them were terminated in 1915 and 3 prior to March 1, 1916, leaving 19 on the rolls.

LENGTH OF ENROLMENT AT MILK STATIONS

Number Admitted	Super-vised 1913	Super-vised 1914	Termi-nated 1914	Super-vised 1915	Termi-nated 1915	Super-vised 1916	Ter-mi-nated by March 1
<b>Total . .</b>	<b>98</b>	<b>417</b>	<b>298</b>	<b>119</b>	<b>97</b>	<b>22</b>	<b>3</b>
1912- 8	8	8	8	—	—	—	—
1913- 90	90	90	81	9	9	—	—
1914-319	—	319	209	110	88	22	3

A second study was made to discover the period of average enrolment during 1914, the time during which infants were enrolled prior to 1914 and after 1914 not being considered.<sup>1</sup> On this basis it was found that the average enrolment in 1914 was 107.4 days, or but little more than half the average time for which infants were enrolled during various years.

It is evident from this fact that nearly two-thirds of all infants enrolled are summer babies, who are brought to the milk stations only to be

<sup>1</sup> Details as to the method followed may be secured by application to the Library of the Rockefeller Foundation.



helped in tiding over the hot weather; and that about one-third belong to the class of permanently enrolled infants, who stay with the stations from one year to another until they are two years old.

The table on page 68 shows the result of investigations made at two city stations in two different years and at one private station, with a view to determining the average period of enrolment and the relation which this bears to the total number of infants reached. This represents an individual card study of no less than 1,409 different infants. It will be noticed that the average length of enrolment in any one year is approximately the same for different public stations. Private stations seem, however, to be able to hold infants once enrolled somewhat longer than municipal stations, the average enrolment within a given year having been 114.5 days for the private as against 107.4 for the city stations; and the total time during which infants were kept on the rolls having been 233 days for the private and 200.2 days for the municipal stations. The table on page 69 gives additional details.

**Saving in Lives through Home Visiting.**  
The basic records kept of the work done by

## AVERAGE PERIOD OF ENROLMENT AND ITS RELATION TO THE TOTAL NUMBER OF INFANTS REACHED

	Infants under 1 Year of Age			Grand Total	Infants under 2 Years Enrolled in 1914		
	Enrolled in 1915		Enrolled in 1914 Station A		Station A	Station C	
	Station A	Station B					
Number reached .....	300	352	177	829	417	340	
Equivalent in infant-years ...	86.1	117.8	45.4	249	123	106	
Per cent which infant-years bear to total number reached .....	28.7%	33.5%	25.7%	30.0%	29.5%	31.2%	
Average period of enrolment within the year .....	104	122	93	109	107.4	114.5	
Total days enrolment from year to year .....	—	—	—	—	200.2	233	

Station A—244 Mulberry Street (City)

Station B—289 Tenth Avenue (City)

Station C—453 East 121st Street (New York Diet Kitchen Association)

THE RELATION BETWEEN ENROLMENT AND TERMINATION OF ENROLMENT OF INFANTS UNDER ONE YEAR OF AGE AT MUNICIPAL BABY HEALTH STATION, 244 MULBERRY STREET, DURING THE YEAR 1915

Month	Enrolled			Terminated	Attaining First Birthday during Year
	Total	New	Re-enrolled		
<b>Total . . . .</b>	<b>238</b>	<b>232</b>	<b>6</b>	<b>103</b>	<b>28</b>
January . . . .	16	16	—	1	—
February . . . .	11	11	—	4	—
March . . . . .	20	20	—	2	2
April . . . . .	14	14	—	3	1
May . . . . .	17	17	—	2	1
June . . . . .	24	24	—	11	1
July . . . . .	28	28	—	17	2
August . . . . .	30	29	1	2	6
September . . .	23	21	2	24	5
October . . . .	26	25	1	14	1
November . . .	17	16	1	11	6
December . . .	12	11	1	12	3

home-visiting nurses were sufficiently accurate to permit of an approximate determination of the importance of this work in the reduction of infant mortality in 1915 *so far as this was accomplished during the period of care given infants*. It was necessary, however, to make a special investigation to arrive at the facts. It was found that the 108 home-visiting nurses who were employed by the city did the work during

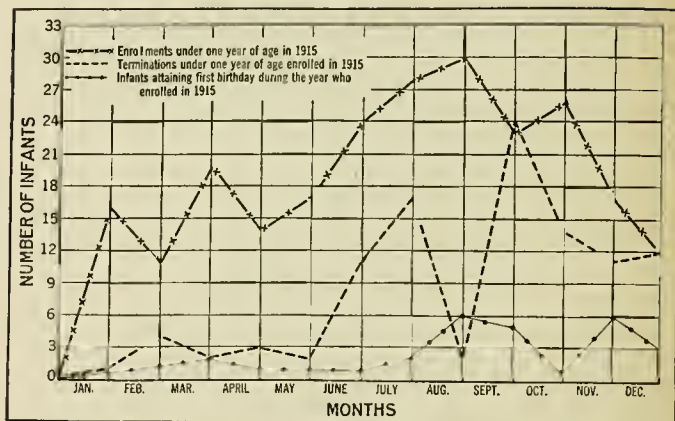


Fig. 9. Relation between enrolment and termination of enrolment of infants under one year of age at municipal baby health station, 244 Mulberry Street, during the year 1915. Based on table, page 69

a period of 71 days, from July 3 to September 11, 1915, and that they had 16,247 infants on their rolls. Each infant was enrolled on an average of 53.7 out of the 71 days, so that the equivalent enrolment of the 16,247 infants on a 71-day basis was 12,267, which is equal to 75.5 per cent of the total number of infants reached.

The total number of recorded deaths among the 16,247 infants reached was 179 (*Goldwater 35-1-1915*), to which must be added approximately 8 deaths from contagious diseases and accidents, making a total of 187. On this basis, the mortality rate among infants cared

for by home-visiting nurses during the summer period was 78.3 per thousand. It is believed that this rate is an overstatement of the results accomplished by home-visiting nurses. These nurses have selective power in enrolling infants. They do not enrol sick infants. They are free to give preference to breast-fed infants. No less than 87 per cent of all infants enrolled by such nurses in 1915 were breast fed.<sup>1</sup> Hence the home-visiting nurses start their work with a better average of babies than that common to the community. The work lasts only 71 days, and the average time during which an infant is under care is but 53.7 days. If an infant falls sick, it may be referred to a baby health station, to a private physician, or to some hospital. If under such circumstances it dies, it is only rarely charged to the nurse who enrolled it. Contrary to the Department rules, and apparently in spite of vigilance on the part of nurses, mothers sometimes enrol their babies both at baby health stations and with home-visiting nurses. At one station 9 per cent were found thus doubly enrolled. In such cases the

<sup>1</sup> See page 76 for source of the above figure. A canvass of the city by the Department of Health, including almost all the tenement districts of Manhattan, showed that in the general population 80 per cent of the mothers nurse their infants (*Herrman 33-425-1909*).

influence of two agencies receives expression in the death rate.

The infant-mortality rate among the unsupervised infants during this summer period was 140.3 per thousand.<sup>1</sup> All ages are represented in this rate. The infants cared for by home-visiting nurses were, on an average, five and one-half months old at the time of enrolment and seven and one-sixth months old at the time of termination of enrolment. For this age-group, the average mortality rate of the population of the city as a whole, calculated by use of the method already referred to in the footnote on page 56, was 64.3 per thousand. Since the rate for the city as a whole was 98.1, the injection of the age factor meant a reduction of 33.8 per thousand in the rate. Assuming that the age factor represented a similar reduction among infants subject to the rate of 140.3 per thousand, it follows that the rate among infants of the same age-group as those cared for by home-visiting nurses was 106.5 per thousand during the summer period of 1915. This takes into account the conditions under which the infants were living as well as the age factor. Since the rate among the infants cared for by home-visit-

<sup>1</sup> The manner in which this figure was secured is fully explained on page 61.

ing nurses was about 78.3 per thousand, there must have been a saving of about 28.2 per thousand infants enrolled. The average enrolment in terms of infant-years was found to be 12,267. From this it follows that *during the seventy-one-day period* of home-visiting in the summer of 1915 about sixty-seven lives were saved.<sup>1</sup>

**How Saving in Lives by Home-Visiting Nurses Was Brought About.** The influence for better health which home-visiting nurses were able to exercise could be brought to bear only during the brief summer period of seventy-one days in which infants were under their care. The average period for which infants were enrolled was, as already stated, but 53.7 days. An average of six visits was made to each home. Only well infants who were not already cared for at baby health stations were enrolled. Each nurse supervised about 150 infants. Acting on the theory of prevention rather than of cure, breast-fed babies are given preference, in the hope of inducing mothers to continue breast feeding after city care has been withdrawn. Very young infants are, for this reason, sought.

<sup>1</sup> This work led to other life saving, of course, and rendered other good services. See also in this connection pages 96-97.

Since the percentage of breast-fed infants is greatest among the youngest infants, little difficulty was encountered in getting a complete roll of 150.

The care given included: (1) physical examination of infants; (2) instruction of mother in baby care, in importance of breast-feeding, in milk modification where necessary, and in general home hygiene; (3) circulars of instruction covering infant care and certain feeding formulas left at the first visit, the latter being printed in English, Yiddish, and Italian; (4) in case the infant became ill, more frequent visits, and wherever possible, provision of free medical service; and (5) visits to all sick or delicate infants by field medical inspectors, who left instructions for the nurse.

**Closer View of Home-Visiting Work.** In the absence of adequate statistical data for all of the districts in which home visiting was done, a detailed study of the work in one district, which had its headquarters at 244 Mulberry Street, was made. Three nurses were employed, caring for 298 infants. One of these was a substitute nurse who cared for one infant, to which she made two visits. One nurse cared for 172 infants, to which she made 1,097 visits in the



course of the 71-day period, or an average of 6 visits per infant. The other nurse cared for 125 infants, to which she made 710 visits, or an average of 5 visits per infant.

**Average Period of Supervision.** An average of 53.7 days of supervision was given to each infant enrolled at one time or another during the 71 days. On this basis the average number of infants enrolled for the full period of 71 days was 225. Since the total number of visits made by the three nurses was 1,809, the average number of visits per infant, on the basis of an average enrolment of 225, during the entire period of 71 days, was 8. Since the average time for which an infant was cared for was but 53.7 days, each infant actually received on an average slightly less than 7 visits during the time that it was cared for.

**Condition of Infants.** Two hundred and ninety-two, or 97.9 per cent of the infants, were in normal health when first visited; five, or 1.6 per cent were sick; one, condition not given. Forty infants, or 13.4 per cent, were sick at some time or other during the period. Of these, twenty-nine had gastro-enteritis and eleven were sick from other causes.

**Method of Feeding.** Two hundred and sixty-one, or 87.5 per cent, were breast fed; six, or 2 per cent, were artificially fed; thirty, or 10 per cent, were mixed fed; one, method not indicated. It is not known how many were breast fed at the close of the period.

**Cases Terminated.** Two hundred and fifty of the 298 infants who at one time or another during the period were on the rolls remained on the rolls at the close of the period. Of these, 245 were in normal health, and 4 were sick; in one case, the condition was not given. Of the forty-eight cases which had been terminated before the close of the home-visiting period, it was found that twenty-eight had moved from the district; eight had enrolled at other baby health stations; five were over age—that is, exceeded one year; in two cases the mother refused to attend the station; one case was taken to the country and one to the hospital. In one case the reason was not stated, and two cases died.

**Double Enrolment.** Among other things, the desire for as many free ice tickets as possible, it is thought, led mothers to conceal the fact that they had enrolled their infants both at milk stations and with home-visiting nurses.

This fact was brought out at the close of the home-visiting period, when the nurse in charge of the baby health station at 244 Mulberry Street followed up all infants who had been enrolled with the home-visiting nurses, with a view to urging the mothers to enrol their babies at baby health stations. Twenty-seven infants, or 9 per cent of the 298, it was found, had already been enrolled with baby health stations, contrary to the policy of the Bureau of Child Hygiene.

**Cost of the Work.** A detailed statement of the total cost of operating baby health stations in 1915 could not be obtained.<sup>1</sup> A statement of the cost for 1914 was, however, available. During that year the operation of fifty-six baby health stations cost the city \$203,283.06.<sup>2</sup> This does not include the cost of dispensing milk, which was met by the milk companies and which

<sup>1</sup> More recently figures were obtained. The total cost for 1915 amounted to \$155,529.38 (*Copeland 9-2-1920*). The total budget appropriation for 1915 was \$213,042.04.

<sup>2</sup> Details on which this total is based can be obtained on application to the Library of the Rockefeller Foundation, New York City. This cost includes, in addition to infant care, certain limited services rendered to children and adults, the amount of which could not be determined. Present accounting methods do not permit of an accurate determination of the cost of various lines of work. It is believed, however, that the figure given is approximately correct.

amounted to \$15,857.04. The total number of infants under two years of age enrolled at baby health stations in 1914 was 38,808. The equivalent of this enrolment, in terms of infant-years, was 11,444. The per-capita cost to the city per infant-year, hence, was \$17.76. Including the dispensing of milk, the cost was \$19.15. The estimated cost of caring for infants under one year of age in 1915 was \$189,374.88. This figure was obtained as follows: In 1915, 37,197 infants under one year of age were enrolled at baby health stations. The equivalent of this enrolment in terms of infant-years was 10,663. Assuming that the per-capita cost for infants under one year of age and under two years of age was about the same, and assuming further that the per-capita cost of 1915 was about the same as in 1914, it follows that the total cost of the work at \$17.76 per infant-year was, as above stated, about \$189,374.88.<sup>1</sup>

It is of interest to compare the cost of intensive work done by the baby health stations and by home-visiting nurses. Since the home-visiting nurses did their work during the period from July 3 to September 11, 1915, the cost of baby health station work was ascertained for this

<sup>1</sup> Including the cost of dispensing milk, which was borne by a milk company, the total cost was \$204,196.45.

particular period. It was found to be \$52,-648.63.<sup>1</sup> The total cost to the city on account of home-visiting nurses during 1915 was \$42,679.75.<sup>2</sup>

In considering statements of cost, it is important to bear in mind the limitations of all financial statistics dealing with infant-welfare work. The departmental records are wholly inadequate and cannot be used to produce an accurate statement of the cost of the work. Various items had to be approximated. Others were lost completely in accounts that had nothing to do with infant-welfare work, while in some other cases charges that were not concerned with infant-welfare administration were included in the report as part of the cost of this work. The table on page 80 should be examined only with these various limitations clearly in mind.

**Saving of Infant Lives through Private Agencies.** From the statistical point of view very little can be said on this point. The his-

<sup>1</sup> Details on which this total is based can be obtained on application to the Library of the Rockefeller Foundation, New York City.

<sup>2</sup> Details on which this total is based can be obtained on application to the Library of the Rockefeller Foundation, New York City. Home-visiting nurses use baby health stations as their headquarters. This overhead expense is not included in the above statement.

## COST OF CONDUCTING INFANT-WELFARE WORK

	Baby Health Stations		Home-visiting Nurses for the 71-Day Summer Period
	For the Entire Year	For the 71-Day Summer Period	
Total cost . . . . .	\$189,374.88	\$52,648.63	\$42,679.75
Average enrolment in terms of infant-years . . . . .	10,663	11,013	12,267
Cost per infant enrolled:			
Per day . . . . .	.049	.068	.049
Per month . . . . .	1.48	2.04	1.48
Per year . . . . .	17.76	24.57	17.83
Number of lives saved during period of care <sup>1</sup> . . .	457	92	67

torical development of the different agencies, their purpose, and their methods can, however, be described.<sup>2</sup> Something fairly definite can be said concerning their activities in operating milk stations and in employing home-visiting nurses during the last few years. Beyond this it is difficult to go, save to remark that these agencies

<sup>1</sup> It is important to bear in mind that other life saving derived from this intensive work is not included in the statistics given here, but represents an important item on the credit side of this class of work. See in this connection pages 96-98.

<sup>2</sup> Those interested may obtain information in detail by applying to the Librarian of the Rockefeller Foundation.

are manifestly engaged in a good work, and that in the light of what is known of similar municipal work they help materially to reduce the loss of infant lives.

Their greatest accomplishment has probably been an indirect one—that of focusing public attention on child-welfare problems and securing municipal action on a large scale. Had it not been for the example they set and for the experiments successfully carried out by them, it is problematical whether New York City would today be giving such extensive attention to infant-welfare work.

**Work Prior to 1900.** By reference to Figure 1 on page 12, it will be noticed that the decline of the infant-mortality rate during the early period from 1885 to 1900 was continuous and marked, many thousands of lives being saved annually through an improvement in sanitary conditions which increased the security of infant life. Yet during that period very little intensive or direct infant-welfare work was done. The city health department employed a summer corps which did good but limited work. Of private agencies, there were only four of any importance in the field. The St. John's Guild operated its excursion boats during the summer

months, each boat making a number of trips in a week, and carrying, for one day's outing, sick children under six years of age with their mothers. The New York Diet Kitchen operated some half-dozen milk stations. Nathan Straus, beginning in 1892, operated six milk stations throughout the year, with ten additional stations during the summer months. The Good Samaritan Dispensary in 1889 opened one milk station.

**Work from 1900 to 1910.** This may be regarded as the formative period during which direct infant-welfare work on a large scale was developed. The Brooklyn Children's Aid Society in 1901 established eleven milk stations. In 1903 and 1904 the Health Department, through a special grant from the Rockefeller Institute, had bacteriological milk studies conducted. In 1905 the Association for Improving the Condition of the Poor began a vigorous campaign for better milk, which in 1906 bore fruit in the organization of the New York Milk Committee. This committee was destined in the course of the next few years to become one of the most powerful factors in infant-mortality work. It developed a series of milk stations which by 1911 numbered thirty-one. In 1906



the Junior Sea Breeze Hospital, for summer work among sick infants, was established under the direction of the Association for the Improvement of the Condition of the Poor. The Henry Street Nurses' Settlement organized its public-nursing service as early as 1893. This settlement in 1908 undertook definitely organized infant-welfare work with one milk station. In the same year the Babies' Dairies, created to care for sick babies, began work at one station.

Toward the close of this period the intensive work done through the medium of milk stations had been sufficiently standardized as to methods and results to win the support of the city, which in 1912 took over some of the thirty-one stations of the New York Milk Committee.

Work from 1911 to 1915. The direct influence of private agencies in reducing infant mortality was probably considerably less after 1911 than before that year, owing to the taking over of many of their milk stations by the city. An idea of the number of infants reached may, however, be gained from the table on page 84.

Statistical data as to the number of infants under one year of age enrolled at private milk stations were not available. It was established, however, that infants under one year of age rep-

INFANTS UNDER TWO YEARS OF AGE ENROLLED AT PRIVATE MILK STATIONS, 1911-1915

Agency	1911	1912	1913	1914	1915
<b>Total . . . . .</b>	<b>13,619</b>	<b>8,195</b>	<b>11,291</b>	<b>12,562</b>	<b>11,536</b>
Babies' Dairies <sup>1</sup> . . . .	248	488	539	636	?
Henry Street Nurses' Settlement . . . .	345	429	400	518	604
New York Diet Kitchen <sup>2</sup> . . . . .	3,000	3,700	4,517	4,900	5,046
Nathan Straus Pasteurized Milk Depots . . . . .	2,171	2,684	5,108	4,079	3,801
All Other Agencies..	7,855 <sup>3</sup>	894 <sup>4</sup>	727 <sup>5</sup>	2,429 <sup>6</sup>	2,085 <sup>7</sup>

<sup>1</sup> Infants under one year only enrolled.

<sup>2</sup> Year extends from November 1 of one year to October 31 of the following year.

<sup>3</sup> Includes babies supervised by the following: Brooklyn Children's Aid Society, 1,429; New York Milk Committee, 5,379; Good Samaritan Dispensary, 957; Madison Square Church House, 90; total, 7,855.

<sup>4</sup> Includes babies supervised by the following: Good Samaritan Dispensary, 801; Madison Square Church House, 93; total, 894.

<sup>5</sup> Includes babies supervised by the following: Good Samaritan Dispensary, 632; Madison Square Church House, 95; total, 727.

<sup>6</sup> Includes babies supervised by the following: Good Samaritan Dispensary, 680; Madison Square Church House, 400; Temporary Summer Infants' Milk Station (during summer months only), 1,349; total, 2,429.

<sup>7</sup> Includes babies supervised by the following: Good Samaritan Dispensary, 385; Madison Square Church House, 218; Temporary Summer Infants' Milk Stations (during summer months only), 1,482; total, 2,085.

resented about 80 per cent of the total enrolment at milk stations in 1915.<sup>1</sup> On this basis the number under one year enrolled at private stations during different years was about 10,895 in 1911, 6,556 in 1912, 9,032 in 1913, 10,049 in 1914, and 9,228 in 1915.<sup>2</sup>

It should be borne in mind also that the infants reported as enrolled were actually in the care of private agencies for widely varying periods of time. A special study of one station of the New York Diet Kitchen Association reveals the fact that the average enrolment of infants under two years of age during the year 1914 was 106; and that the total number of infants reached was 340. Hence the average enrolment expressed in terms of infant-years was 31.17 per cent of the total enrolment. Assuming that conditions at other stations were approximately the same, it would appear that the 9,228 infants under one year of age reached by private agencies in 1915 represented an equivalent of 2,876 infant-years. This represents but 2.8 per cent of the infant population of the city. Assuming, again, that the infant-mortality rate among infants enrolled at private stations was

<sup>1</sup> On the basis of an enrolment in that year at city stations of 46,062 under two years, and 37,197 under one year (*Sobel 52d-1-1916*).

<sup>2</sup> Exclusive of the Babies' Dairies.

about the same as for infants enrolled at municipal stations, or 41.26 per thousand; and assuming, further, that the infant-mortality rate among unenrolled infants in the areas in which private stations operated was about the same as in case of city stations, or 84.1 per thousand, it would follow that about 42.84 lives were saved for every thousand infants enrolled. The enrolment expressed in infant-years was found to have been about 2,876, so that in the city in 1915 approximately 123 lives were saved, *during the period of enrolment*, as a result of the work of baby health stations operated by those private agencies which were studied.<sup>1</sup>

<sup>1</sup> In presenting these general figures it is not intended to express with mathematical precision the benefits conferred by private agencies through this form of work. It matters little whether the number of lives saved was about 123, as stated, or 223. Though the first figure is probably very much closer to the truth than the second, either figure will serve to restrain the imagination and to point to the approximate extent of life saving which resulted from this work during the period of actual care. This is all that it was hoped to accomplish.

### III

## MOVEMENT OF INFANT-MORTALITY RATE AND ITS POSSIBLE RELATION TO INTENSIVE DIRECT INFANT-WELFARE WORK DURING PERIOD 1910-1915

**General Results.** With a view to throwing further light on the effectiveness of direct and intensive effort in the reduction of the infant-mortality rate, a study by years for the period from 1910 to 1915 has been made. Each disease group was taken up separately for each of the following three geographical areas: (1) New York City as a whole; (2) Manhattan and the Bronx; and (3) New York City outside of Manhattan and the Bronx. The comparison between Manhattan and the Bronx and the rest of the city was prompted by the fact that by far the most intensive infant-welfare work is being done in the former area. Figures 10 and 11, pages 89 and 90, show (1) that for diarrheal, respiratory, and contagious diseases, and the "all other" group, the *movement* of the rate, whether an increase or a decrease, was about the same in

all three areas, and that the rate itself did not differ markedly in one area from that in another; (2) that in the case of congenital diseases the city rate remained about the same, whereas the rate for Manhattan and the Bronx showed a decline of 10.3 points per thousand, and that for the area outside of Manhattan and the Bronx an increase of 13.4 per thousand; (3) that in the case of diarrheal diseases the rate was lower, and for all other groups higher, for Manhattan and the Bronx than for the area outside of these two boroughs; (4) that for the city as a whole there was no appreciable change in rate of congenital or of contagious diseases, but a decline of 4.5 deaths per thousand in respiratory diseases, of 16.68 deaths per thousand in diarrheal diseases, and of 10.98 per thousand in diseases falling into the "all other" group; (5) that in the year 1915, for the city as a whole, there was a slight increase of 1.2 per thousand in deaths from respiratory diseases, and of 1.02 per thousand in deaths from diarrheal diseases. There also was a slight increase in deaths due to contagious diseases and in deaths falling in the "all other" group.

**The Congenital Disease Rate.** Probably the most striking development is that which took

place in the realm of congenital diseases, and which is expressed by a fairly decided decline in Manhattan and the Bronx and an equally decided increase in New York City outside of Manhattan and the Bronx, except as to the year

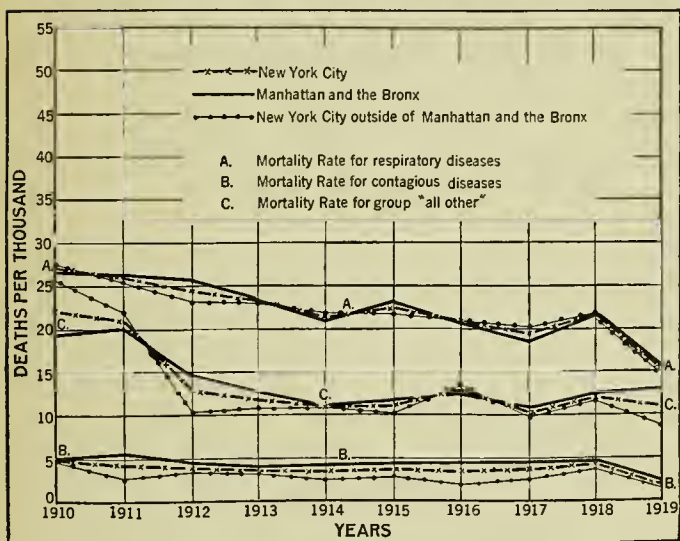


Fig. 10. Movement of the infant-mortality rate by groups of diseases for the years 1910-1919, inclusive. Based on Appendices VI, VII, and VIII, pages 131-133

1915, in which the tendencies in both areas were the reverse. A ready explanation for this movement is not at hand, although the work done among expectant mothers by the city as well as by private agencies probably contributed vitally

to the decline in the rate in Manhattan and the Bronx.

In the spring of 1913 the city established at one of the municipal infants' milk stations a center of instruction for the training of special

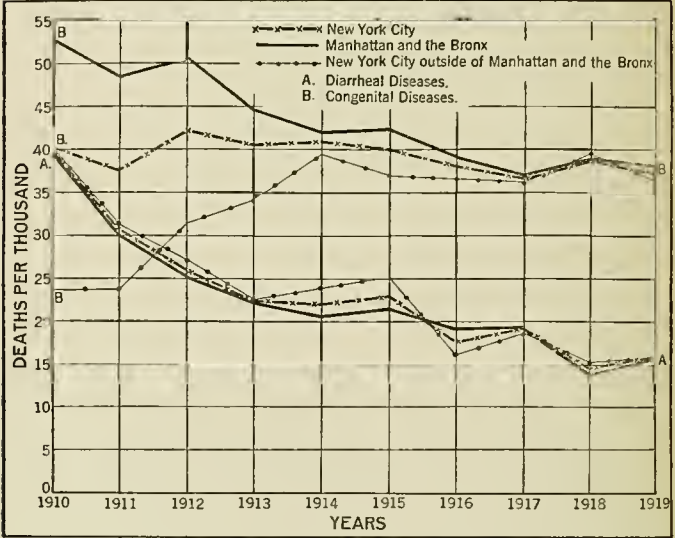


Fig. 11. Movement of the infant-mortality rate by groups of diseases for the years 1910-1919, inclusive. Based on Appendices VI, VII and VIII, pages 131-133

nurses in prenatal work. In 1914 seven nurses were assigned to this work. In the next year the number was increased to eight, all-year-round work being carried on. In the city's experimental health district, special emphasis was also placed on the instruction of expectant



mothers. The excellent service rendered by the City Health Department during the last few years in encouraging the treatment and cure of venereal diseases by offering to make free examinations, may also have contributed to the same result.

The New York Milk Committee in 1911 undertook the first work among expectant mothers. After two years of experimentation the results were found sufficiently satisfactory to induce the city to enter the field. At the time of the establishment of the experimental health center of the Milk Committee in 1913, this work was made one of the most important features of the center.

In 1912 the New York Diet Kitchen likewise entered the field with work at one station. Since then work among expectant mothers has become one of the regular activities carried on at all the stations.

In 1907 the Association for Improving the Condition of the Poor began work among expectant mothers in a limited way. It was not, however, until the fall of 1914 that the work was undertaken on a slightly larger scale, when three special nurses began to devote to it a part of their time.

Since all the work, whether municipal or pri-

vate, among expectant mothers, was done in the Borough of Manhattan, it would seem that the main impress was left on the congenital disease rate in this area. This is borne out by the table shown on page 38. It is more difficult to account for the increase in the rate which took place in the area outside of Manhattan and the Bronx. It was this increase which kept practically the same throughout the five-year period the rate for the city as a whole.

**Diarrheal Diseases.** Two important aspects of the intensive, direct infant-welfare work seem to stand out in connection with the movement of the diarrheal death rate. On the one hand the declining rate seems to offer proof of the effectiveness of the work, and on the other of the secondary importance of the work from the point of view of scope and influence as an infant-life saving force.

No group of deaths is influenced so vitally by infant-welfare work as diarrheal diseases. More of this work was done in Manhattan and the Bronx than in the rest of the city. If what has been said holds, there should be a noticeable difference in the rate of decline in deaths due to diarrheal diseases in these two areas. Substantiation of this seems to be found in the statis-

tical tables on pages 17 and 19, and in the chart on page 21. From 1910 to 1915 there was a decline of 18.5 deaths per thousand in the diarrheal rate of Manhattan and the Bronx, whereas the decline of the rate for the area outside these two boroughs for the same period was but 14.2 points. Conditions in Manhattan and the Bronx, as is well known, favor a higher death rate from diarrheal diseases than do those in the rest of the city. Not only was the *rate of decline* for Manhattan and the Bronx relatively larger, but in 1915 the absolute death rate due to diarrheal diseases was lower by 3.8 points than in the case of the rest of the city.

The most plausible explanation for this situation would seem to be that intensive infant-welfare work, which is done on a larger scale and by more numerous agencies in Manhattan and the Bronx than elsewhere, has left a larger impress on the conditions which influence deaths from diarrheal diseases.

**Increase in Milk Stations and Decrease in Mortality from Diarrheal Diseases.** A suggestive chart showing the increase in the number of public and private milk stations and the decrease in the mortality rate from diarrheal diseases during the period from 1910 to 1915 is

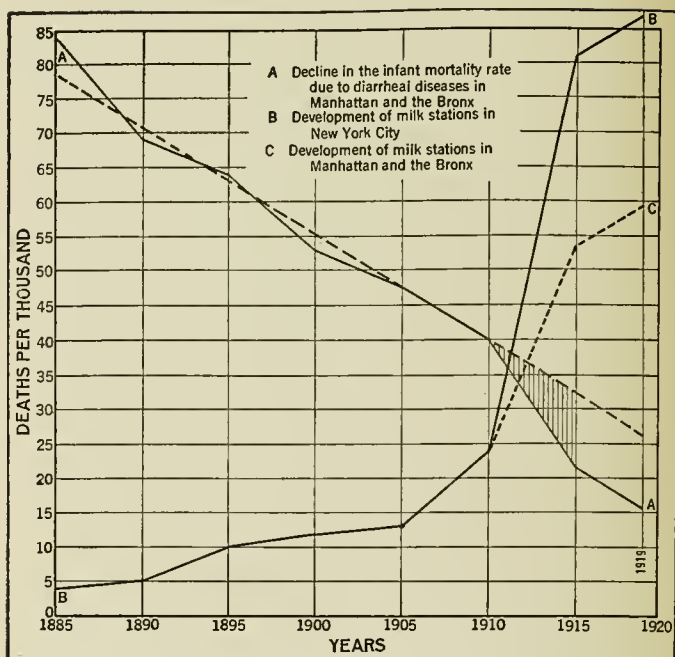


Fig. 12. The relation of baby health stations to the decline in the death rate from diarrheal diseases

shown above (Figure 12). In order that the study might have a desirable background, both diagrams were carried back as far as 1885. The number of milk stations increased from twenty-four in 1910 to eighty-two in 1915 (with an addition of twenty-eight summer stations in 1910 and eighteen in 1915).<sup>1</sup> It will be noticed that

<sup>1</sup> There were eighty-eight baby health stations in operation in 1919, with an addition of eight summer stations.

during the last five years the decline in the rate from diarrheal diseases was somewhat more rapid than during the entire preceding period.

If a median line be drawn to show the average rate of decline for the thirty years, the shaded area on the chart may be looked upon as indicating the saving of lives in addition to those which would have been saved under average conditions of the past. This shaded area is a graphic expression of the result of the *increase in effort* of all agencies interested in infant-welfare work which took place since 1910.

The city took the leading part in this work through its Bureau of Child Hygiene, which since its establishment in 1908 has been under the direction of Dr. S. Josephine Baker, and also through those bureaus which have to do with the supervision of the city milk supply. On a smaller scale but equally important was the work done by a large number of private agencies, which, while highly deserving of mention, could not be studied in detail in an investigation of this character.

To prevent possible misunderstanding it may be well to reiterate that in plotting the chart on page 94, showing the relation between milk stations and diarrheal disease, no special importance was attached to the milk station as

a dispensing point for pure milk. At present every mother everywhere in the city can buy pure and safe milk. The dispensing of milk seems to be a bait to get the mother to enroll. The factors of greatest importance evidently are personal educational work and physical supervision by doctors and nurses, both of which are preventive in their main purpose.

**Efficiency Measured in Terms of Lives Saved.** It has been said that the value of infant-welfare work cannot be properly expressed in terms of the number of lives saved, because its benefits also extend, in large measure, to those infants who do not die. No satisfactory way seems thus far to have been found for expressing in useful statistical terms the benefits derived by those infants which survive. It has, however, proved entirely feasible, both at home and abroad, to express the results of infant-welfare work in terms of the infant-mortality rate.

It is quite evident, of course, that in addition to the saving of lives during the period of care as set forth on preceding pages, infant lives were saved after termination of this care by virtue of the increased ability of mothers to care properly for their babies. Nor is this saving

limited to the first or the second year of the child. It continues into the later years of childhood and finds expression even in maturity.

Corresponding in a measure with the manner in which lives are saved, the work also reduces morbidity among infants and children. Vast economic importance must be attached to this fact, for—aside from doctors' bills, loss of time of those caring for children, and other financial sacrifices—mental and physical suffering with their attendant complications are apt to be important factors in family well-being. There is also the large direct gain to society which comes from improved health and strength on the part of the rising generations.

Contemplation of the vast but indefinite benefits that go with all work for the improvement of infant life, or for the reduction in infant deaths, opens up a wide field of speculation as to the total social and economic benefits derived from this type of work. This should be kept in mind when weighing the cost of such work, particularly when such cost is expressed in terms of lives saved. Statements of cost, if properly prepared, should serve a useful purpose in expressing relative efficiency as between methods and cities. They cannot, however, be used as a final or complete criterion of the value of such

work, or of the wisdom of using public funds for it. Improved health, greater vitality, larger resistance to disease, and greater powers of future service on the part of the increasingly large numbers of infants who survive, as well as on the part of mothers and others who are enabled to benefit by the instruction received—these are the indefinite values of infant-welfare work. To attempt to measure them in terms of money would be as futile as to attempt to count the drops of the ocean. Every intelligent student of social affairs will draw his own picture and will value these services according to his particular experience and point of view.

**Relation of a Larger Public Health Policy to Specialized and Individual Infant Care.** The facts brought out in this study concerning the extent of infant-life saving by a large group of specialized agencies organized on a broad basis and spending several hundred thousand dollars of public and private funds per year, may well set the mind to thinking as to the relation of intensive infant-welfare work to a larger health program. During the last thirty years certain fundamental health factors seem to have been created under names and in forms which we may not be accustomed to recognize.



These evidently were great controlling factors which entered deeply into the social fabric and exercised an unsuspecting and powerful influence upon the health of people both old and young. As pointed out elsewhere, conditions of infant life in New York City were so changed between 1885 and 1915 as to bring about the remarkable saving of some 24,000 infant lives during the year 1915.<sup>1</sup>

Extraordinary progress was made in the sanitary quality of the things we eat and drink—our water supply and our foods, particularly milk; in the healthfulness of the houses in which we live; in the paving, cleaning, and sprinkling of streets, and the provision of more open spaces in which we move; in the scavenger system of garbage disposal and in sewerage, which carry off the wastes of living; in the elimination of surface privies; in protection against flies and other insect life which spread diseases. All these are, as we know, immensely vital conditions which affect our daily lives and health.

So far as the future is concerned we may no longer look to general sanitary improvement for any large measure of reduction in infant mortality. If continued progress in this direction

<sup>1</sup> See page 17 for an explanation of the manner in which this figure was derived.

is to be made, it will be necessary for the city government to appropriate funds in increasingly large measure for intensive infant-welfare work such as has been so efficiently carried on by the Bureau of Child Hygiene since its establishment. Without continuation of intensive effort it may be doubted whether any very marked further decrease in the infant-mortality rate is to be looked for. What can be accomplished by such effort under conditions as they exist in New York City at the present time, is illustrated by the striking decline in deaths, particularly from diarrheal disease, during recent years. It is unquestionably the efficient work in the field of intensive infant care at present being done in New York City which has made infant life in the great metropolis more secure than in any other large city in the world.

Reference to the diagram presented on page 55 shows a marked decrease in infant mortality after the first month of life. It is evident that under existing methods the great mass of infants who were reached were brought under the influence of care several months after they had passed through the critical period of heavy mortality which occurs during the first few months of life. This feature of the work deserves close attention and careful considera-

tion by those who are interested in the administrative policy involved in this important field. A factor which tends to minimize the value of educational work is the extreme mobility of the population of the city and the tremendous influx of foreigners through immigration.

The reduction in the infant-mortality rate of the city will become increasingly difficult and expensive as the rate is forced down. Close attention will need to be given to all the details of intensive methods that are to be employed. Much uncertainty still exists as to the relative values of efforts in this field. The difficulty surrounding a definite determination of the influence which this or that factor exercises is so great as to discourage from the outset any investigation of this point. #

There would seem to be much reason to believe, on the basis of the present study, that in a city with a very high infant-mortality rate but generally poor conditions of sanitation, the inauguration of intensive infant-welfare work, such as that involved in the maintenance of baby health stations or of home-visiting nurses, is impractical and would probably yield relatively poor results for the time and money applied. Rather, according to the findings of this investigation, should the fact of a high mortality rate

in such a community be used as an argument for general sanitary improvement. Such fundamental sanitary factors as water supply, sewage and refuse disposal, surface privies, manure piles, street cleaning and sprinkling, housing and parks, and the milk supply, should receive a broad and energetic support from infant-welfare organizations at that period of the city's history.

Domestic sanitation in the home and personal cleanliness likewise have an obviously vital bearing on infant mortality. The question may well be asked: Will the pursuit of the larger purpose lead more surely, more quickly, and more completely to the attainment of the specific end sought, than a concentration at the outset on expensive, intensive infant care? Analysis of the work done in New York City would certainly seem to direct attention to the significance of carrying out the larger phases of sanitary problems while the smaller intensive objectives of infant-life saving are being planned. A concrete interest in some one thing, coupled with a specific aim, seems to be necessary to enlist public support. And when once such support has been secured, and organized under some appropriate name, may not a community of the type just described (cities like New York have,

of course, proceeded far beyond this stage of sanitary neglect) find that the direction of effort to a larger purpose is the quickest means of reaching the particularized goal?

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## APPENDICES

I

CHRONOLOGICAL STATEMENT OF THE DEVELOPMENT OF  
BABY HEALTH STATIONS IN NEW YORK CITY

	Number of Stations Operated	
	Year Round	Summer Only
1873: Private Station		
1. N. Y. Diet Kitchen Association	1	
1874: Private Stations		
1. N. Y. Diet Kitchen Association	2	
1875: Private Stations		
1. N. Y. Diet Kitchen Association	2	
1876-1884: Private Stations		
1. N. Y. Diet Kitchen Association	3	
1885-1887: Private Stations		
1. N. Y. Diet Kitchen Association	4	
1888: Private Stations		
1. N. Y. Diet Kitchen Association	5	
1889: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Eastern Dispensary (very limited effort)		
1890: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Good Samaritan Dispensary (formerly Eastern Dispensary) .....		1
1891: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Good Samaritan Dispensary...		1



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	Number of Stations Operated	
	Year Round	Summer Only
1892-1893: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Good Samaritan Dispensary...		1
3. Nathan Straus Pasteurized Milk Depots .....	6	10
1894-1897: Private Stations		
1. N. Y. Diet Kitchen Association	4	
2. Good Samaritan Dispensary...		1
3. Nathan Straus Pasteurized Milk Depots .....	6	10
1898-1899: Private Stations		
1. N. Y. Diet Kitchen Association	4	
2. Good Samaritan Dispensary...	1	
3. Nathan Straus Pasteurized Milk Depots .....	6	10
1900: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Good Samaritan Dispensary...	1	
3. Nathan Straus Pasteurized Milk Depots .....	6	10
1901: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Good Samaritan Dispensary...	1	
3. Nathan Straus Pasteurized Milk Depots .....	6	10
4. Brooklyn Children's Aid Society		11
1902: Private Stations		
1. N. Y. Diet Kitchen Association	5	
2. Good Samaritan Dispensary...	1	
3. Nathan Straus Pasteurized Milk Depots .....	6	10
4. Brooklyn Children's Aid Society		12
1903-1904: Private Stations		
1. N. Y. Diet Kitchen Association	6	

		Number of Stations Operated	
		Year	Summer
		Round	Only
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	6	10
	4. Brooklyn Children's Aid Society		14
1905-1906:	Private Stations		
	1. N. Y. Diet Kitchen Association	6	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	6	10
	4. Brooklyn Children's Aid Society		15
1907:	Private Stations		
	1. N. Y. Diet Kitchen Association	6	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	7	10
	4. Brooklyn Children's Aid Society		15
1908:	Private Stations		
	1. N. Y. Diet Kitchen Association	8	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	7	10
	4. Brooklyn Children's Aid Society		16
	5. New York Milk Committee...	7	
	6. Babies' Dairy .....	1	
	7. Henry Street Nurses' Settlement .....	1	
1909:	Private Stations		
	1. N. Y. Diet Kitchen Association	8	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	8	10
	4. Brooklyn Children's Aid Society		16
	5. New York Milk Committee...	7	

INFANT MORTALITY IN NEW YORK CITY 117

		Number of Stations Operated	
		Year Round	Summer Only
	6. Babies' Dairy .....	1	
	7. Henry Street Nurses' Settlement .....	1	
1910:	Private Stations		
	1. N. Y. Diet Kitchen Association	9	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	8	10
	4. Brooklyn Children's Aid Society		18
	5. New York Milk Committee...	4	
	6. Babies' Dairy .....	1	
	7. Henry Street Nurses' Settlement .....	1	
1911:	Private Stations		
	1. N. Y. Diet Kitchen Association	9	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	8	10
	4. Brooklyn Children's Aid Society		14
	5. New York Milk Committee...	31	
	6. Babies' Dairies .....	2	
	7. Henry Street Nurses' Settlement .....	1	
	8. Morningside Dispensary .....	1	
	Municipal Stations		
	1. Department of Health .....	15	
1912:	Private Stations		
	1. N. Y. Diet Kitchen Association	9	
	2. Good Samaritan Dispensary...	1	
	3. Nathan Straus Pasteurized Milk Depots .....	8	10
	4. Babies' Dairies .....	3	
	5. Henry Street Nurses' Settlement .....	1	

		Number of Stations Operated	
		Year Round	Summer Only
	6. Morningside Dispensary . . . . .	1	
	7. Madison Square Church House	1	
	Municipal Stations		
	1. Department of Health . . . . .	55	
1913:	Private Stations		
	1. N. Y. Diet Kitchen Association	9	
	2. Good Samaritan Dispensary . . .	1	
	3. Nathan Straus Pasteurized Milk Depots . . . . .	8	10
	4. Babies' Dairies . . . . .	3	
	5. Henry Street Nurses' Settlement . . . . .	1	
	6. Madison Square Church House	1	
	Municipal Stations		
	1. Department of Health . . . . .	56	
1914:	Private Stations		
	1. N. Y. Diet Kitchen Association	8	
	2. Good Samaritan Dispensary . . .	1	
	3. Nathan Straus Pasteurized Milk Depots . . . . .	8	10
	4. Babies' Dairies . . . . .	3	
	5. Henry Street Nurses' Settlement . . . . .	1	
	6. Madison Square Church House	1	
	Municipal Stations		
	1. Department of Health . . . . .	56	
	2. Temporary stations, financed by private organizations but administered by Department of Health . . . . .		7
1915:	Private Stations		
	1. N. Y. Diet Kitchen Association	9	
	2. Good Samaritan Dispensary . . .	1	

INFANT MORTALITY IN NEW YORK CITY 119

	Number of Stations Operated	
	Year Round	Summer Only
3. Nathan Straus Pasteurized Milk Depots .....	8	10
4. Babies' Dairies .....	3	
5. Henry Street Nurses' Settlement .....	1	
6. Madison Square Church House	1	
Municipal Stations		
1. Department of Health.....	59	
2. Temporary stations financed by private organizations but administered by Department of Health .....		8
1919: Private Stations		
1. N. Y. Diet Kitchen Association	8	
2. Nathan Straus Pasteurized Milk Depots .....	8	8
3. Babies' Dairies .....	4	
4. Nurses' Settlement .....	3	
5. Lebanon Clinic .....	1	
6. Vanderbilt Clinic .....	1	
7. Greenwich House .....	1	
8. Dobbs (Masters School) .....	1	
9. Madison Square Church House	1	
Municipal Stations		
1. Department of Health.....	60	

	1916	1917	1918	1919
Number of baby health stations under supervision of Department of Health .....	59	59	59	60
Number of babies under supervision of above stations under 1 year	39,646	41,496	41,691	39,304
"    2 years	8,656	5,669	4,491	6,571
Total .....	<u>48,302</u>	<u>47,165</u>	<u>46,182</u>	<u>45,875</u>

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INFANT-MORTALITY RATE IN MUNICIPAL BABY HEALTH  
STATION DISTRICTS IN 1915

District Number	Reported Births	Reported Deaths	Infant Mortality Rate	Other Baby Health Stations Located in District
<b>Total..</b>	<b>46,562</b>	<b>4,975</b>	<b>106.84</b>	
1	1,071	265	247.43	
2	1,319	174	131.00	
3	1,668	215	128.90	
4	1,938	201	103.71	Straus
5	1,550	170	109.68	
6	615	56	91.10	
7	2,022	214	105.83	
8	749	74	98.80	
9	3,651	312	85.46	
10	857	62	72.30	Straus
11	594	62	104.40	
12	670	51	76.12	Good Samaritan
13	2,450	167	68.16	
14	2,094	161	76.88	
15	2,430	176	72.42	
16	933	117	125.40	
17	1,601	290	181.13	Bellevue Hospital <sup>1</sup>
18	1,879	208	110.69	
19	3,099	332	107.13	Babies' Dairies
20	2,291	332	144.91	
21	3,199	318	99.40	
22	1,837	171	93.08	Straus
23	2,139	231	107.99	
24	872	110	126.14	
25	670	51	76.12	
26	2,104	192	91.25	
27	1,635	184	112.53	
28	625	79	126.40	

<sup>1</sup> The high death rate seems to be due to the fact that, because of absence of any address, many deaths among infants at the hospital are charged to the health district in which the hospital is located.

	Health District <sup>1</sup>	Re-ported Births <sup>1</sup>	Re-ported Deaths <sup>1</sup>	Infant Mor-tality Rate <sup>1</sup>
Milk station district No. 1, 55th Street to 68th Street, Central Park W. and Broadway to River.	107	225	31	137.80
	113	175	102	583.00
	117	166	14	84.30
	109	99	19	191.91
	115	239	75	314.00
	119	167	24	143.70
Total .....	.....	1,071	265	247.43
Milk station district No. 2, 45th Street to 55th Street, Broadway to River.	95	385	30	77.90
	101	262	53	202.30
	97	349	52	149.00
	103	323	39	120.70
Total .....	.....	1,319	174	131.00
Milk station district No. 3, Sixth Avenue to West Street, Christopher Street to W. 23rd Street.	41	89	16	179.78
	43	344	45	130.82
	45	176	32	181.83
	47	151	13	86.10
	49	129	19	147.28
	51	146	18	123.30
	53	239	29	121.30
	55	64	7	109.40
	57	158	22	126.60
59	172	14	81.40	
Total .....	.....	1,668	215	128.90
Milk station district No. 4, Christopher Street to Canal Street, Broadway to West Street.	25	746	70	93.82
	27	199	17	85.43
	29	91	12	131.80
	35	388	48	123.70
	37	465	44	94.62
	39	49	10	204.10
Total .....	.....	1,938	201	103.71

<sup>1</sup> Obtained from Bureau of Records of the Department of Health.



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	Health District <sup>1</sup>	Re-ported Births <sup>1</sup>	Re-ported Deaths <sup>1</sup>	Infant Mor-tality Rate <sup>1</sup>
Milk station district No. 5,	13	490	38	77.66
Broome Street to Park	15	25	4	160.00
Row and Chambers Street,	19	956	121	126.50
Broadway to Bowery.	23	79	7	88.63
Total .....	.....	1,550	170	109.68
Milk station district No. 6,				
Second Street to Broome	21	615	56	91.10
Street, Broadway to Bow- ery.				
Milk station district No. 7,	1	49	5	102.05
Market Street to Battery	5	17	4	235.29
Park, Broadway, Park	8	1,028	90	87.56
Row, and Division Street	9	268	42	156.71
to East River.	11	660	73	115.00
Total .....	.....	2,022	214	105.83
Milk station district No. 8,				
Bowery to Orchard	16	749	74	98.80
Street, Broome Street to				
Division Street.				
Milk station district No. 9,				
Bowery to Orchard	18	1,372	106	77.28
Street, Second Street to	30	1,384	100	72.26
Broome Street.	36	895	106	111.80
Total .....	.....	3,651	312	85.46
Milk station district No. 10,				
Clinton Street to Market	6	857	62	72.30
Street, Division Street to				
East River.				

<sup>1</sup> Obtained from Bureau of Records of the Department of Health.

	Health District <sup>1</sup>	Re-ported Births <sup>1</sup>	Re-ported Deaths <sup>1</sup>	Infant Mor-tality Rate <sup>1</sup>
Milk station district No. 11, Grand Street to Scam- mel Street to East River.	2	594	62	104.40
Milk station district No. 12, Orchard Street to Pitt Street, Rivington Street to Grand Street.	14	670	51	76.12
Milk station district No. 13, Orchard Street to Colum- bia Street, Second Street to Rivington Street.	22 30	1,066 1,384	67 100	62.86 72.26
Total .....	.....	2,450	167	68.16
Milk station district No. 14, Pitt, Rivington, and Co- lumbia Streets to East River, E. Houston Street to Grand Street.	10 12 20	548 681 865	46 50 65	83.94 73.41 75.16
Total .....	.....	2,094	161	76.88
Milk station district No. 15, Bowery and Third Avenue to Lewis Street, Second Street to Eighth Street and St. Mark's Place.	26 32 38	1,071 711 648	50 66 60	46.70 92.82 92.60
Total .....	.....	2,430	176	72.42
Milk station district No. 16, First Avenue to East River, E. 23rd Street to E. 16th Street.	44 46	269 664	42 75	156.32 113.00
Total .....	.....	933	117	125.40

<sup>1</sup> Obtained from Bureau of Records of the Department of Health.

## INFANT MORTALITY IN NEW YORK CITY 125

	Health District <sup>1</sup>	Re-ported Births <sup>1</sup>	Re-ported Deaths <sup>1</sup>	Infant Mor-tality Rate <sup>1</sup>
	54	178	137	769.60
Milk station district No. 17,	56	289	38	131.50
Fourth Avenue to East	58	555	56	100.90
River, E. 32nd Street to	60	56	6	107.10
E. 18th Street.	62	442	46	104.10
	64	81	7	86.40
Total .....	.....	1,601	290	181.13
	68	302	32	105.90
Milk station district No. 18,	70	54	8	148.10
Lexington Avenue to East	74	165	15	90.90
River, E. 32nd Street to	76	404	47	116.30
E. 55th Street.	78	549	70	127.50
	80	51	8	156.90
	84	354	28	79.10
Total .....	.....	1,879	208	110.69
	108	520	56	107.70
	110	462	53	114.71
Milk station district No. 19,	112	95	10	105.28
Lexington Avenue to East	116	431	45	104.40
River, E. 69th Street to	118	541	70	129.40
E. 85th Street.	120	474	45	94.90
	122	440	46	104.55
	124	136	7	51.48
Total .....	.....	3,099	332	107.13
	136	74	7	94.60
Milk station district No. 20,	138	388	30	77.31
Fifth Avenue to East	140	681	63	92.40
River, 85th Street to 101st	142	283	34	120.13
Street.	128	397	132	332.50

<sup>1</sup> Obtained from the Bureau of Records of the Department of Health.

	Health District <sup>1</sup>	Re-ported Births <sup>1</sup>	Re-ported Deaths <sup>1</sup>	Infant Mor-tality Rate <sup>1</sup>
Milk station district No. 20 (continued).	130	319	46	144.20
	132	149	20	134.20
Total .....	.....	2,291	332	144.91
Milk station district No. 21, Fifth Avenue to East River, E. 101st Street to E. 108th Street.	146	246	28	113.82
	148	971	97	99.90
	150	495	40	80.80
	152	376	27	71.80
	154	1,111	126	113.40
Total .....	.....	3,199	318	99.40
Milk station district No. 22, Fifth Avenue to East River, E. 108th Street to E. 114th Street.	156	369	36	97.60
	158	457	27	59.10
	164	1,011	108	106.80
	Total .....	.....	1,837	171
Milk station district No. 23, Fifth Avenue to East River, E. 114th Street to E. 120th Street.	162	670	78	116.40
	166	390	32	82.10
	168	544	39	71.70
	174	535	82	153.30
	Total .....	.....	2,139	231
Milk station district No. 24, Seventh Avenue to Eleventh Avenue, W. 23rd Street to W. 36th Street.	61	59	13	220.40
	63	209	25	119.60
	65	215	27	125.60
	67	204	21	102.90
	71	57	5	87.70
	73	128	19	148.40
Total .....	.....	872	110	126.14

<sup>1</sup> Obtained from the Bureau of Records of the Department of Health.

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	Health District <sup>1</sup>	Re-ported Births <sup>1</sup>	Re-ported Deaths <sup>1</sup>	Infant Mor-tality Rate <sup>2</sup>
Milk station district No. 25, Orchard Street to Di- vision Street to Grand Street.	Part of 14	670	51	76.12
Milk station district No. 26, Avenue A to Avenue D, E. 8th Street to E. 16th Street.	28 34	903 1,201	87 105	96.36 87.44
Total .....	.....	2,104	192	91.25
Milk station district No. 27, St. Mark's Place to E. 18th Street, Avenue A to Third Avenue.	40 46 48	737 664 234	65 75 44	88.20 113.00 188.05
Total .....	.....	1,635	184	112.53
Milk station district No. 28, Park Avenue to Seventh Avenue, 128th Street to 132nd Street.	194 196 212 214	154 181 112 178	12 32 10 25	77.90 176.80 89.30 140.45
Total .....	.....	625	79	126.40

<sup>1</sup> Obtained from Bureau of Records of the Department of Health.

### III

TABLE SHOWING THAT THE EFFECT OF IMPROVED CARE DURING INFANCY IS NOTICEABLE ALSO IN AN INCREASED RESISTANCE TO DISEASE DURING CHILDHOOD

Period Covered: 1904-1919. (*Baker 31-66-1915; New York City Bureau of Child Hygiene 29-1-1920.*)

Age of Infants: As stated in table.

Based on: Death rates per 1,000 Living Children (estimated) in New York City.

	Under 1 Year	Between		Under 5 Years
		1 and 2 Years	2 and 5 Years	
1904	164.0	56.9	17.9	58.5
1905	163.0	47.2	14.7	54.9
1906	164.0	50.0	14.8	56.2
1907	160.0	46.1	14.2	54.9
1908	144.0	41.9	13.1	50.0
1909	137.0	45.3	13.1	49.5
1910	134.0	40.1	12.2	47.7
1911	120.0	34.4	10.5	42.1
1912	110.0	31.1	9.4	38.3
1913	102.0	30.5	9.5	36.4
1914	94.6 <sup>1</sup>	29.8 <sup>2</sup>	9.2 <sup>2</sup>	32.9 <sup>3</sup>

<sup>1</sup> 1914-1919 rates under one year of age based on reported births; all other rates based on estimated population.

<sup>2</sup> *Guilfoyl 72a-1-1915.*

<sup>3</sup> *New York City Bureau of Child Hygiene 29-1-1920.*

[Concluded on following page]







III

[*Concluded*]

	Under 1 Year	Between		Under 5 Years
		1 and 2 Years	2 and 5 Years	
1915	98.2	29.1	8.9	....
1916	93.1	28.3	10.9	....
1917	88.8	23.9	7.8	....
1918	91.7	32.8	11.8	....
1919	81.6	.....	6.9	....

Average Rate for Five-Year Periods

1904-1908 incl. ....	159.0	48.4	15.0	54.9
1909-1913 incl. ....	120.0	36.3	10.9	42.8
1914-1918 incl. ....	93.2	28.4	9.7	....
Decrease per cent, 1904-1913 .....	24.5	25.0	27.0	22.0
Decrease per cent, 1914-1918 .....	22.3	21.7	11.0	....

## V

DECLINE IN THE INFANT-MORTALITY RATE FROM VARIOUS CAUSES IN MANHATTAN AND THE  
BRONX DURING THE PERIOD FROM 1885 TO 1919<sup>1</sup>

Disease	1885	1890	1895	1900	1905	1910	1915	1919
<b>Total</b> .....	<b>273.60</b>	<b>227.70</b>	<b>214.80</b>	<b>193.00</b>	<b>169.90</b>	<b>143.60</b>	<b>102.7</b>	<b>84.4</b>
Contagious .....	20.82	14.63	12.87	9.45	5.88	4.85	4.3	2.1
Diarrheal .....	84.28	69.22	64.15	53.12	47.64	39.94	21.4	15.8
Respiratory .....	42.23	42.78	43.43	42.15	33.35	26.73	23.1	15.3
Congenital } .....	42.05	55.82	55.81	55.17	55.97	52.50	42.2	37.9
Marasmus <sup>2</sup> } .....	84.20	45.34	38.55	31.75	27.11	19.61	11.6	13.0
All other .....								

<sup>1</sup> Rate based on estimated population, which for the years 1890, 1895, 1900, 1905, and 1910 was computed from the number of reported deaths under one year and the infant-death rates as given on pages 158-160 of the Annual Report of the Department of Health of the City of New York for the year 1914. For the 1885 rates see footnote 3, page 19; for the 1915 rates see footnote 1, page 131. The population figures used were: 1885, 34,002; 1890, 45,157; 1895, 52,445; 1900, 52,213; 1905, 60,705; 1910, 69,647; 1915, 79,763. For 1919, the rate is based upon reported births.

<sup>2</sup> Rate dropped from 23.3 in 1901 to 9.07 in 1902. Beginning with 1912, marasmus has been included with congenital rate by the city. For purposes of comparison this compelled its inclusion for all preceding periods.

TABLE SHOWING THE ESTIMATED INFANT POPULATION, THE INFANT DEATHS, AND THE INFANT-MORTALITY RATES FOR THE PERIOD FROM 1885 TO 1919

(The Figures Starred Were Used in the Chart on Page 16)

	1885	1890	1900	1905	1910	1915	1916	1917	1918	1919
Estimated Population of New York City .....	1,338,299 <sup>1</sup>	1,515,301 (68-187)	3,437,202 (68-188)	4,000,423 (58-111) 4,025,742 (81) 4,102,042 <sup>2</sup>	4,766,883 (68-188)	5,468,190 (81)	5,602,841	5,737,492	5,872,143	6,006,794
Estimated Infant Population .....	34,002 <sup>3</sup>	37,076 (65-126)	86,597 (59-138)	98,560 <sup>2</sup>	110,524 (68-220) 121,007 <sup>4</sup>	137,798 (72b)	141,192	144,585	147,978	151,371
Reported Births .....	30,035 (90b)	39,250 (32-154)	81,721 (32-688) 87,787 <sup>5</sup>	103,880 (32-688)	129,080 (32-191) 129,316 (5-87)	141,256 (81)	137,664	141,564	138,046	130,377
Estimated Actual Births..	37,543 <sup>6</sup>	46,176 <sup>6</sup>	90,801 <sup>6</sup>	115,422 <sup>6</sup>	135,873 <sup>6</sup>	144,138 <sup>6</sup>	140,473	144,453	140,863	133,027
Reported Infant Deaths..	9,303 (90a)	10,288 (90a)	16,627 (1-133)	16,498 (1-327) 16,522 (32-58)	16,215 (32-172) 16,159 (1-560)	13,866 (81)	12,814	12,568	12,657	10,639
Mortality Rate Based on Estimated Infant Population .....	*273.60 (82-9)	277.48 (82-9) 279.35 (62.31) *227.70 (32-158)	*192.0 <sup>7</sup>	*167.3 <sup>8</sup>	*146.2 <sup>7</sup> 134.0 (32-81)	*100.62 <sup>9</sup>	90.7	86.9	85.5	70.3
Mortality Rate Based on Reported Births .....	*309.73 <sup>10</sup>	*262.11 <sup>10</sup> 240.84 (82-10)	*203.46 <sup>11</sup> 189.4 (11-691)	*159.0 (32-58)	*125.0 (5-87) *125.0 (31-53) *125.0 (32-58)	*98.1 <sup>10</sup>	93.1	88.8	91.7	81.6
Mortality Rate Based on Estimated Actual Births	*247.79 <sup>12</sup>	*222.79 <sup>12</sup>	*183.11 <sup>12</sup>	*142.93 <sup>13</sup>	*118.9 <sup>13</sup>	*96.1 <sup>12</sup>	91.2	87.0	89.4	79.9

<sup>1</sup> Computed from census populations of 1870 and 1880 according to census method of securing annual estimate of population.<sup>2</sup> Obtained by dividing by two the sum of the 1900 census and the 1910 census.<sup>3</sup> Computed from infant death rate per 1,000 population under one year as furnished by Census Bureau and reported deaths given by Department of Health.<sup>4</sup> Computed from infant death rate per 1,000 population under one year as furnished by Department of Health and reported deaths given by the Department of Health.<sup>5</sup> Computed from infant mortality rate per 1,000 living births and reported deaths under one year as furnished by Census Bureau.<sup>6</sup> Based on information furnished by Bureau of Records of the Department of Health that reported births represented 80 per cent of estimated actual births in 1885; 85 per cent in 1890; 90 per cent in 1900; 95 per cent in 1910; and 98 per cent in 1915.<sup>7</sup> Based upon estimated population under one year and reported deaths as furnished by the Census Bureau.<sup>8</sup> Based upon reported deaths under one year as furnished by the Census Bureau and estimated population under one year (see note 2).<sup>9</sup> Based upon estimated population and reported deaths under one year of age as given by the Department of Health.<sup>10</sup> Based on births reported to the Department of Health and deaths under one year of age.<sup>11</sup> Based on reported deaths as given by the Census Bureau and reported births as given by the Department of Health.<sup>12</sup> Based on estimated actual births and reported deaths as furnished by the Department of Health.<sup>13</sup> Based on estimated actual births and reported deaths under one year as furnished by the Census Bureau.

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VI

MOVEMENT OF THE INFANT-MORTALITY RATE FROM VARIOUS CAUSES DURING THE PERIOD  
1910 TO 1919 FOR NEW YORK CITY<sup>1</sup>

Disease	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
<b>Total</b> . . . . .	<b>134.0</b>	<b>120.0</b>	<b>110.0</b>	<b>102.0</b>	<b>99.0</b>	<b>100.6</b>	<b>93.1</b>	<b>88.8</b>	<b>91.7</b>	<b>18.6</b>
Contagious . . . . .	4.7	4.3	3.8	3.6	3.4	3.7	3.3	3.7	4.3	1.9
Diarrheal . . . . .	39.7	30.7	26.1	22.4	22.0	23.0	17.7	19.1	14.7	15.9
Respiratory . . . . .	27.1	26.0	24.8	23.4	21.4	22.6	21.0	19.4	21.7	15.5
Congenital . . . . .	40.2	37.7	42.1	40.5	40.9	40.0	38.0	36.5	38.7	37.2
All other . . . . .	22.1	21.1	12.9	11.8	11.0	11.1	13.1	10.2	12.2	11.2

<sup>1</sup> Rate based on estimated population, which for the years 1910-1914, inclusive, was computed from the number of reported deaths under one year and the infant-death rates as given on page 66 of the monograph published by the Bureau of Child Hygiene. The reported deaths and the estimated population for 1915 were secured from the Bureau of Records of the Department of Health. The population figures used were: 1910, 121,007; 1911, 125,441; 1912, 129,900; 1913, 135,098; 1914, 134,405; 1915, 137,798. For 1916, 1917, 1918, and 1919, the rate is based on reported births.

## VII

MOVEMENT OF THE INFANT-MORTALITY RATE FROM VARIOUS CAUSES DURING THE PERIOD  
1910 TO 1919 FOR MANHATTAN AND THE BRONX<sup>1</sup>

Disease	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
<b>Total</b> . . . . .	<b>143.6</b>	<b>130.7</b>	<b>120.9</b>	<b>107.1</b>	<b>99.0</b>	<b>102.7</b>	<b>96.3</b>	<b>91.3</b>	<b>91.9</b>	<b>84.4</b>
Contagious . . . . .	4.8	5.4	4.2	3.9	4.0	4.3	4.3	4.5	4.7	2.1
Diarrheal . . . . .	39.9	30.1	25.2	22.3	20.5	21.4	19.1	19.3	14.1	15.8
Respiratory . . . . .	26.7	26.4	25.9	23.6	21.1	23.1	20.9	18.8	21.6	15.3
Congenital . . . . .	52.5	48.4	50.5	44.5	42.0	42.2	39.0	36.7	38.7	37.9
All other . . . . .	19.6	20.1	14.8	12.6	11.0	11.6	12.7	10.3	12.5	13.0

<sup>1</sup> Rate based on estimated population, which for the years 1910-1914, inclusive, was computed from the number of reported deaths under one year and the infant-death rates as given on page 160 of the Annual Report of the Department of Health of the City of New York for the year 1914. The reported deaths and the estimated population for 1915 were secured from the Bureau of Records of the Department of Health. The population figures used were: 1910, 69,647; 1911, 71,278; 1912, 72,767; 1913, 77,413; 1914, 80,148; 1915, 79,763. For 1916, 1917, 1918, and 1919, the rate is calculated from the reported births.

VIII

MOVEMENT OF THE INFANT-MORTALITY RATE FROM VARIOUS CAUSES DURING THE PERIOD 1910 TO 1919 FOR NEW YORK CITY OUTSIDE OF MANHATTAN AND THE BRONX <sup>1</sup>

Disease	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
<b>Total</b> .....	<b>120.8</b>	<b>105.7</b>	<b>95.9</b>	<b>95.0</b>	<b>99.0</b>	<b>97.3</b>	<b>89.0</b>	<b>86.2</b>	<b>91.3</b>	<b>78.2</b>
Contagious .....	4.6	2.8	3.3	3.2	2.6	2.9	2.0	2.6	3.7	1.6
Diarrheal .....	39.4	31.4	27.2	22.6	24.0	25.2	16.1	18.7	15.3	15.8
Respiratory .....	27.6	25.5	23.4	23.2	22.0	21.9	21.0	20.3	21.7	15.5
Congenital .....	23.6	23.7	31.4	35.2	39.4	37.0	36.6	36.1	39.5	36.3
All other .....	25.6	22.3	10.6	10.8	11.0	10.3	13.5	9.9	11.8	8.9

<sup>1</sup> This table was derived from the two preceding tables by mathematical calculation. The estimated population under one year was found to be: 1910, 51,360; 1911, 54,163; 1912, 57,133; 1913, 57,685; 1914, 54,257; 1915, 58,035. For 1916, 1917, 1918, and 1919, the rate is based upon reported births.

DEATH RATES OF CHILDREN UNDER FIVE YEARS OF AGE ACCORDING TO NATIONALITY OF MOTHER.  
BOROUGH OF MANHATTAN, 1915<sup>1</sup> (Guilfoy 30-14-1917)

	No. of Mothers	Total Deaths	Rate per 10,000 All Causes	Deaths—Infectious Diseases	Rate per 10,000	Deaths—All forms Tuberculosis	Rate per 10,000	Deaths—Syphilis	Rate per 10,000	Deaths—Acute Respir. Diseases	Rate per 10,000	Deaths— Diarr. Diseases	Rate per 10,000	Deaths from Accidents	Rate per 10,000
All nationalities .....	275,644	10,187	370	1,181	43	465	17	117	4	2,690	97	1,826	66	242	8
United States .....	68,919	2,760	400	259	38	143	21	42	6	548	79	553	80	55	8
Ireland .....	19,658	724	368	111	57	38	19	4	2	120	61	142	72	20	10
Germany .....	6,220	201	323	21	34	9	14	2	3	32	51	30	48	8	13
Italy .....	66,144	2,814	425	381	58	109	16	33	5	1,165	176	460	70	48	7
Russia .....	53,387	1,330	249	163	30	61	11	11	2	326	61	160	30	57	11
England .....	2,867	116	405	10	35	6	21	1	3	11	38	26	91	15	52
Austria-Hungary .....	40,585	1,067	263	148	36	45	11	8	2	247	61	211	52	24	6
British America .....	3,408	20	59	1	3	1	3	..	..	4	12	4	12	..	..
Switzerland .....	374	13	348	..	..	..	..	..	..	4	107	3	80	..	..
France .....	936	21	224	2	21	..	..	..	..	3	32	1	11	1	11
Bohemia .....	2,019	45	223	6	30	1	50	..	..	11	54	8	40	1	5
Sweden .....	1,314	37	282	2	15	2	15	..	..	3	23	8	61	1	8

<sup>1</sup> These rates are based upon 10,000 births to mothers of various nationalities, occurring during the years 1910 to 1914 inclusive, in the Borough of Manhattan, with exclusion of deaths under five years of age during the quinquennium immediately preceding the year of mortality—that is, 1915.



## X

THE INFLUENCE OF RACE ON THE INFANT-MORTALITY  
RATE OF NEW YORK CITY IN THE YEARS 1916 AND  
1917

(*New York City Department of Health 32-138-1916;*  
*New York City Department of Health 32-78-1917*)

Nativity of Both Parents	Births Reported		Deaths Under One Year		Death Rate per 1,000 Births Reported	
	1916	1917 <sup>1</sup>	1916	1917 <sup>1</sup>	1916	1917 <sup>1</sup>
United States . . .	37,590	37,555	3,976	4,165	105.7	110.9
Italy . . . . .	29,011	28,989	2,924	2,661	100.6	91.8
Russia-Poland . . .	23,016	24,099	1,734	1,533	75.3	63.6
Austria-Hungary .	10,613	10,377	881	746	92.4	74.6
Ireland . . . . .	4,662	4,752	534	535	114.5	112.6
Germany . . . . .	1,764	1,704	192	170	108.8	99.8
England . . . . .	443	669	44	27	99.3	40.3
Sweden . . . . .	463	567	46	41	99.4	72.3
Bohemia . . . . .	225	246	21	16	93.3	65.0
Scotland . . . . .	191	158	13	13	68.1	82.3
France . . . . .	82	85	8	9	97.5	105.9
Other foreign } Mixed (native & foreign) } Unknown }	29,604	32,363	2,443	2,652	82.6	81.9

<sup>1</sup> No reports containing similar statistics were published by the Department of Health of New York City after 1917.

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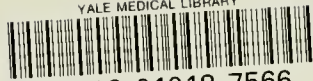








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